J. Baskin

EVALUATION STUDY OF THE INLAND WATERS DIRECTORATE DATA BASE FOR TOTAL CYANIDE MEASUREMENTS IN WESTERN CANADA (1974-1983), AND THE ANALYTICAL METHODOLOGY USED TO DERIVE THIS DATA BASE

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October 02, 1986

Dr. James E. Gaskin
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Water Quality Branch
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Dear Dr. Gaskin:

Re: Evaluation Study of the Inland Waters Directorate Data Base for Total Cyanide Measurements in Western Canada (1974-1983), and the Analytical Methodology Used to Derive this Data Base

Please find enclosed 5 copies of our final report on the above project provided, following your review and comment on an earlier draft. We have assessed the data provided in terms of specificity and trends, in terms of toxicological significance, and have recommended improvements to the analytical methodologies.

We have enjoyed working with you on this most interesting project, and trust that this report completes our present assignment to your satisfaction.

Sincerely,

ASL ANALYTICAL SERVICE LABORATORIES LTD.

A.W. Maynard, M.Sc.,
Senior Partner

AWM/mkm

TABLE OF CONTENTS

		Page No.
Title Page		i
Letter of Transmittal		ii
Table of Contents		iii
List of Figures		iv
List of Tables		iv
Acknowledgements		v
EXECUTIVE SUMMARY		1
1.0	INTRODUCTION	3
1.1	Objectives	4
2.0	APPROACH	5
3.0	BACKGROUND INFORMATION - CYANIDE LEVELS	7
3.1	Terminology	7
3.2	Natural Background Levels of Total Cyanide in Freshwater	8
3.3	Cyanide Concentrations of Biological Concern in Freshwater	10
	3.3.1 Toxicity of Cyanide	10
	3.3.2 Factors Affecting Cyanide Toxicity	12
4.0	BACKGROUND INFORMATION - ANALYTICAL CHEMISTRY	15
4.1	Cyanide Analysis	15
	4.1.1 Total Cyanide	16
	4.1.2 Simple Cyanide	19
	4.1.3 Free Cyanide	21
	4.1.4 Summary	23

Page No.

4.2 Quality Assurance Requirements for Low Level Analyses 25
4.2.1 Definition of Detection Limit 27
4.2.2 Quality Assurance Samples 29
4.2.3 Recommended Quality Assurance Approach 30

5.0 CYANIDE LEVELS IN SURFACE WATERS FROM THE PRAIRIE PROVINCES AND THE NORTHWEST TERRITORIES 36
5.1 Laboratory Methodology Used 36
5.2 Data Processing Methodology 38
5.3 Identification of Significant Sites 40

6.0 RESULTS AND DISCUSSION OF SUMMARIZED DATA 43
6.1 Description of Summarized Data 43
6.2 Discussion of Analytical Methods 43
6.3 Toxicological Significance 44
6.4 Comparison to Natural Levels 45
6.5 Regional and Seasonal Trends 45

7.0 CONCLUSIONS AND RECOMMENDATIONS 48

8.0 REFERENCES CITED 51

TABLES OF SIGNIFICANT SITES 56

FIGURES OF SIGNIFICANT SITES 73

APPENDIX 1 - DATA SUMMARY - CYANIDE
2 - DATA SUMMARY - TEMPERATURE
3 - DATA SUMMARY - pH
4 - DATA SUMMARY - CONDUCTIVITY

LIST OF FIGURES

Figure		Page
1	A generalized summation of the lethal and sublethal effects of HCN upon fish	12
2	Effect of temperature on the toxicity of cyanide to rainbow trout	14
3	Measurement of precision and accuracy of an analysis	26
4	Example of a precision and accuracy control chart based on the analysis of a synthetic standard prepared independently from the calibration standards	32
5	Criteria for identification of significant sites	42
Figures of Significant Sites		73

LIST OF TABLES

Table		Page
1	Recoveries of cyanide from various complexes with and without U.V. irradiation	20
2	Determination of HCN by the diffusion procedure for phosphate-buffered cyanide solutions at 20°C and containing complexing metals	23
3	Summary of recommended QA program for trace analysis	35
4	Comparison of total cyanide values in each region	46
Tables of Significant Sites		56

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EXECUTIVE SUMMARY

The Water Quality Branch of the Inland Waters Directorate (IWD) has conducted measurements of "total cyanide" values in surface waters in Manitoba, Saskatchewan, Alberta and the Northwest Territories from 1974 to 1983. The purpose of the present study was to review these data to determine patterns and trends, to evaluate the analytical methodology used to produce these data, and to provide recommendations related to future methods of analysis and geographic areas of potential concern.

A literature review was carried out to assess the toxicological significance of cyanide concentrations. Two levels of biological concern were established, assuming that measured "total cyanide" levels were equivalent to toxicologically important "free cyanide" levels:

- 0.005 mg/L - as the beginning of sublethal effects of free cyanide on sensitive species
- 0.030 mg/L - as the beginning of lethal effects of free cyanide on sensitive species

These levels formed the basis of criteria developed to establish significant sites. However, since there is no established relationship between total and free cyanide, the toxicological significance of the IWD data base is unknown.

The extremely large volume of data (3481 lines of data containing total cyanide values and other pertinent water quality data) received on magnetic tape was summarized in manageable formats (presented in Appendices 1-4). Criteria were established to identify sites considered significant, in terms of frequently detected cyanide concentrations above the two specified levels. Seventy-seven sites (out of a total of 163) were identified for further investigation. Sites from the Northwest Territories contained the highest levels of cyanide (to a maximum of 79 mg/L) thought to be due to mining activities (J. Gaskin, IWD, pers. comm.). The sites from the Prairie provinces had lower cyanide values but often contained levels above 0.030 mg/L. The lowest levels overall were recorded from sites in Alberta.

The absolute validity of the data, in terms of methods of analysis, could not be established because of the absence of laboratory and field quality assurance data for the study period. A comprehensive quality assurance program specifically designed for a trace analysis program is recommended for future IWD studies and is outlined in Section 4.2.3.

Future analyses should include both total and free cyanide measurements and recommendations are made concerning the selection of cyanide methods (Section 7.0).

1.0 INTRODUCTION

Cyanide-containing compounds occur throughout the environment and may be attributed to both natural and man-made sources (Leduc et al., 1982). Cyanides comprise a diverse group of chemical substances characterized by the $-C \equiv N$ group which, because of their toxicity, are considered among the major pollutants of receiving waters (Leduc et al., 1982).

Numerous investigations have been carried out to assess the toxicological and environmental dynamics of the major cyanide compounds, but the results of these studies have not always been inter-comparable. The variable terminology pertaining to cyanides (i.e., "total", "dissolved", "free", "simple", "complex") has caused confusion among investigators from industry and regulatory agencies. Moreover, different studies have used various analytical procedures to analyse for cyanides, thus the results are often analysis-dependent. Finally, chemical cyanide measurements are not always toxicologically meaningful.

The Water Quality Branch of the Inland Waters Directorate (IWD) has conducted measurements of "total cyanide" values in surface waters in Manitoba, Saskatchewan, Alberta and the Northwest Territories from 1974 to 1983. The purpose of the present study was to review these data to determine patterns and trends, to evaluate the analytical methodology used to produce these data, to determine the ecotoxicological significance of these data, and to provide recommendations related to future methods of analysis and geographic areas of potential concern.

1.1 Objectives

The overall objective was to undertake an in-depth study of the accumulated "total cyanide" data base, in order to produce a comprehensive and interpretive report relating to the measured levels. The specific objectives were:

1. To assess the data in terms of site specificity, seasonal trends, regional trends, and any relationships with other pertinent water quality characteristics.

2. To assess the data in terms of toxicological significance, and to recommend any changes to the analytical methods that would provide more meaningful ecotoxicological data.

3. To assess presently available methodologies and to recommend any necessary improvements to present sample collection and analysis methods.

2.0 APPROACH

A general literature review was undertaken to obtain information on:

- natural background levels of cyanide in water
- levels of cyanide that are of biological concern.

This information was required to allow an evaluation of the data generated by the IWD for surface waters in the Prairie provinces and the Northwest Territories. The results of this study component are presented in Section 3.0.

A literature review was undertaken to obtain information on:

- various methods used to analyse for cyanide in water
- steps that should be taken to produce valid data when concentrations are near the limit of detection of a method (i.e. quality assurance protocols).

This information was required to allow an evaluation of the cyanide methods used to generate the IWD data, the quality assurance steps taken to validate the results, and to provide recommendations for future monitoring programs. The results of this study component are presented in Section 4.0.

The entire data base generated by the IWD for the Prairie provinces and the Northwest Territories was reviewed. This task required data reduction steps to organize an extremely large volume of data into manageable formats. This was accomplished by:

- firstly, reducing the data to form a complete data summary
- secondly, developing criteria to identify the sites considered significant in terms of cyanide levels
- thirdly, investigating some of the significant sites in more detail.

The results of this study component are presented in Section 5.0 and the actual data summaries are presented in Appendices 1 - 4. The data summaries were then compared with information in the literature concerning natural levels and levels of concern (Section 6.0).

3.0 BACKGROUND INFORMATION

3.1 Terminology

In any report dealing with a review of cyanide data, it is important to define the variable terminology used by different investigators to describe cyanide levels. This terminology is defined below:

Cyanide Ion : CN^-

Hydrogen Cyanide : HCN (also called molecular cyanide)

Free Cyanide : the summation of CN^- and HCN. There is an equilibrium between these two

$$HCN \rightleftharpoons H^+ + CN^-$$

At pH 8.5 or lower the equilibrium is shifted much more towards the HCN form. (Leduc et al., 1982)

Simple Cyanide : cyanide compounds that dissociate directly in water to a cation and the cyanide ion with no soluble intermediates. Represented by the formula M(CN)x where M is an alkali or a metal.

e.g., NaCN, KCN, $Cd(CN)_2$, CuCN

The solubility and degree of dissociation of these cyanides vary. Cadmium and zinc cyanides dissociate readily whereas copper cyanide is less likely to dissociate (APHA, 1985).

Complex Cyanides : formed with various transition metals. Upon dissociation they form a complex cyanide ion of the general formula

$$\left[M^{n+}(CN)_x\right]^{(x-n)\pm}$$

which may in turn dissociate further to form the cyanide ion.

e.g., $K_3Fe(CN)_6$ potassium ferricyanide
$K_4Fe(CN)_6\ 3H_2O$ potassium ferrocyanide

Some complex cyanides are not soluble in water, e.g., prussian blue (ferric ferrocyanide).

Total Cyanide : a general term describing all the types of cyanide outlined above. Operationally, total cyanide is defined by a particular analysis method (Leduc et al., 1982).

Nitriles : organic cyanide compounds

Cyanate : (CNO^-), usually formed during waste treatment of cyanide.

Thiocyanate : (SCN^-), formed by a reaction of cyanide and reduced sulphur

3.2 Natural Background Levels of Total Cyanide in Freshwater

Molecular cyanide may be produced naturally by microorganisms (Leduc et al., 1982) and by cyanogenic degradation of glycosides produced by many species of plants (Conn, 1979). However, natural background levels of cyanide in the environment remain to be estab-

lished and information is, in general, relatively limited (Leduc, Concordia University, pers. comm.). At present, information on such levels is only available from three published reports.

The Prairie Provinces Water Board (1978) measured total cyanide levels in eleven rural Canadian rivers over a three year period. Apparently natural levels of up to 0.060 mg/L total cyanide were recorded, with highest levels associated with periods of river run-off. These data are part of the data set reviewed in this report.

Krutz (1981) examined rural watersheds in Germany which had no apparent anthropogenic sources of cyanide. Total cyanide levels of up to 0.042 mg/L were recorded in the fall and winter, associated with river run-off.

The Ontario Ministry of the Environment (1984, 1986) carried out analyses of raw and treated drinking water from selected municipalities in the Niagara, Lake Ontario, and St. Clair-Detroit River areas. Free cyanide was one of many parameters analysed in these major drinking water surveys. Cyanide was not detected (detection limit of 0.001 mg/L) in any of the samples collected. Federal Government data for the Ontario region are very limited (J. Lawrence, IWD, pers. comm.).

Determination of true natural background levels is partly mediated by the analytical technique used and the detection limits achievable. However, based on the above studies it appears that natural cyanide levels in freshwater were at or above commonly reported detection limits of 0.005 mg/L.

3.3 Cyanide Concentrations of Biological Concern in Freshwater

3.3.1. Toxicity of Cyanide

Most cyanide toxicity is attributable to free cyanide (Doudoroff, 1976). Measurements of total cyanide are not toxicologically meaningful (Doudoroff, 1976; Leduc et al., 1982; Leduc, 1984), however, present IWD (Western Region) analytical techniques have only measured total cyanide, irrespective of the chemical cyanide species actually present in the water samples analysed. In past years, methods for the analysis of "simple" cyanides were not routine nor well documented. Consequently, total cyanide analyses represented the best choice for cyanide monitoring. Analysis for total cyanide is necessary because the more complex cyanides can gradually decompose to form "free" cyanide.

There is no established relationship between total and free cyanide levels in water samples. Consequently, the only possible approach to establishing concentrations of biological concern from the present total cyanide measurements, such that full protection of the environment is assured, is to assume "worst case" conditions. Specifically, the assumption is made in the following discussion that total cyanide and free cyanide levels are equal. Since free cyanide levels are generally only a portion of the total cyanide levels, this assumption will result in the determination of conservative (i.e., worst case) values for concentrations of total cyanide that are of concern in freshwater.

Cyanide is a rapidly effective respiratory poison, to which fish are more sensitive than invertebrates. For instance, Smith et al. (1979) and Kovacs and Leduc (1982a) have recorded 96-h LC50's for rainbow trout ranging from 0.042 to 0.057 mg/L HCN. In contrast, Call et al. (1983) recorded 96-h LC50's for a variety of benthic invertebrates that ranged from 0.083 to 2.326 mg/L HCN.

Although there is no single concentration limit of free cyanide that can be accepted as universally "safe" for aquatic life, Leduc et al. (1982) in an intensive review of the available literature, noted that at 0.005 mg/L free cyanide there is minimal impairment to freshwater fish, based on laboratory studies; short-term lethality to these same fish begins at 0.030 mg/L free cyanide. The acutely toxic range was defined by Leduc et al. (1982) as 0.030-0.140 mg/L HCN; concentrations of free cyanide greater than 0.1 mg/L will generally kill sensitive fish species in all environments.

The above conclusions are supported by the results of more recent studies. For instance, Koch and Young (1983) found that the no-effect level for fathead minnows exposed to HCN was between 0.0129 and 0.0196 mg/L; significant hatching effects occurred when Atlantic salmon were exposed to HCN at levels of 0.03 to 0.1 mg/L (i.e., equal to or greater than 0.03 mg/L). Billard and Roubard (1985) recorded effects of KCN on fertilization of rainbow trout down to levels of 0.01 mg/L. Other studies supporting the conclusions of Leduc et al. (1982) include those by Lesniak and Ruby (1982) and Heming et al. (1985).

Thus, based on all available studies conducted to date, two separate concentrations of biological concern can be set. A level of 0.005 mg/L is considered the beginning of impairment (sublethal) for sensitive freshwater species. This is also the highest "natural" level of total cyanide in freshwater as determined by Krutz (1981) and matches the U.S. EPA (1985) Water Quality Criteria minimum value of 0.0052 mg/L for free or total cyanide. A level of 0.03 mg/L is considered the beginning of actual deaths (lethal) for sensitive freshwater species. However, this level is only half of the highest "natural" level of total cyanide as determined by the Prairie Provinces Water Board (1978). Information used to derive these two operational concentrations is summarized in Figure 1.

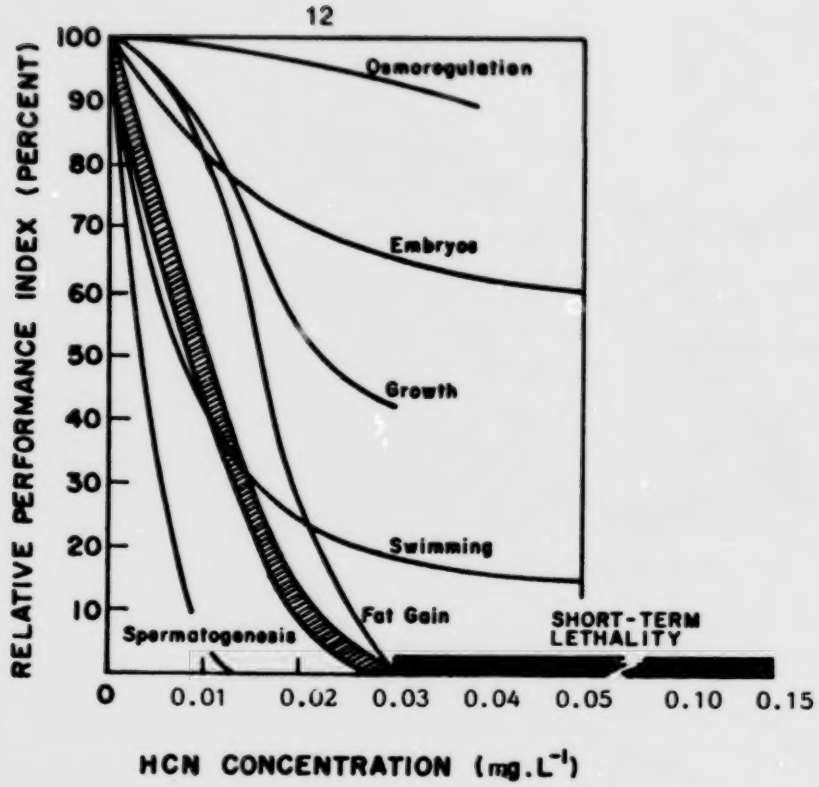

Figure 1 A generalized summation of the lethal and sublethal effects of HCN upon fish

(from Leduc et al, 1982)

3.3.2 Factors Affecting Cyanide Toxicity

Leduc et al. (1982) provide a comprehensive review of all factors tested for their effects on free cyanide toxicity. Unless otherwise stated, the following information is from this source.

Environmental factors that show no apparent effect on cyanide toxicity include: hardness, pH, and conductivity. The only apparent effect of conductivity is when fresh water and fully saline waters are compared. There is no evidence of a pH-mediated effect at normal pH ranges (pH 6-8), nor at normal hardness ranges (5-300 mg/L $CaCO_3$ hardness). Under these water quality conditions of pH and hardness, most of the free cyanide would be present as HCN.

The above remarks are concerned with free cyanide toxicity. It should be mentioned, however, that pH can have a drastic effect on cyanide toxicity when consideration is given to the dissociation of cyanide complexes to form free cyanide.

Biological factors have been shown to mediate toxicity. Such factors include the tolerance of particular organisms, and body size (Leduc, 1981). Species differences also affect toxicity; as previously discussed, fish are more sensitive than invertebrates.

There is some evidence of synergistic reactions between cyanide and other compounds. Broderius and Smith (1979) found that cyanide in the presence of either hexavalent chromium, zinc, or ammonia, had somewhat higher toxicity than could be explained by a simple additive model. However, no further published work is available on this subject. The synergistic effect could be particularly important when assessing the environmental impact of mining effluents.

The environmental factor that has shown the most significant effect on cyanide toxicity is temperature. Temperature-mediated effects are dependent on cyanide concentration such that low concentrations of cyanide (i.e. 0.02 mg/L) are more toxic at lower temperatures than at higher temperatures, while high concentrations of cyanide (i.e. above 0.10 mg/L) are more toxic at higher temperatures than at lower. For instance, a change from 15°C to 5°C can increase 96-hr LC50's for rainbow trout exposed to HCN by 13% while a change from 18°C to 4°C can increase toxicity to brook trout by 63% (Smith et al., 1978). Both lethal and sublethal responses are similarly affected (Kovacs and Leduc, 1982a, b). An example of the effect of temperature on cyanide lethality is provided in Figure 2. In general, from 30oC to 15oC toxicity decreases; from 15oC to 5oC toxicity increases (Leduc et al., 1982).

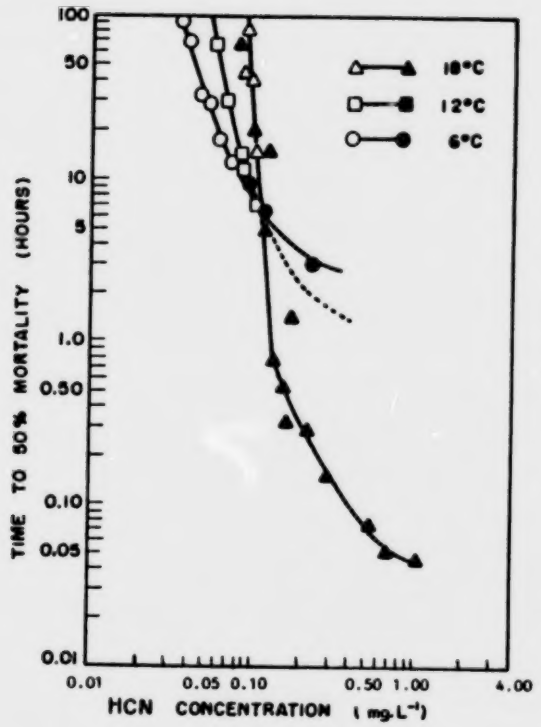

Figure 2. Effect of temperature on the toxicity of cyanide to rainbow trout (from Kovacs and Leduc, 1982a; Leduc et al., 1982)

4.0 BACKGROUND INFORMATION - ANALYTICAL CHEMISTRY

4.1 Cyanide Analysis

Because of the diversity of cyanide species, numerous analytical methods have been developed for their measurement. Reviews have been prepared by Leduc et al. (1982) and by Ecological Analysts (1979). Little new information is available from the literature.

In general, the basic approach to cyanide analysis involves three steps -

Step 1 - Separation Step - cyanide is removed from the sample by a variety of methods that involve a conversion to HCN gas.

Step 2 - Trapping - or impingement of the HCN gas. In most cases this step also concentrates the cyanide.

Step 3 - Measurement - of the trapped HCN by a variety of methods such as colourimetry, titration and others.

In terms of the type of cyanide to be determined (i.e., free vs. total), the most important step is the first - the removal of cyanide from the sample. It a total cyanide analysis is required, the sample is treated with strong acid and heated to accomplish the destruction of all the complex cyanides. Irradiation with U.V. light is also commonly used to dissociate cyanide complexes. If free or simple cyanide analyses are required, less drastic conditions are used to isolate HCN.

In terms of sensitivity of the analysis, the most important step is Step 3, the measurement of trapped cyanide. Various methods have been proposed to enhance sensitivity; colourimetric methods have been the most commonly proposed for such enhancement.

There are other approaches to cyanide analysis that are worthy of mention as well, including:

gas chromatography,
ion chromatography,
electrochemistry,
membrane techniques.

These are discussed under the appropriate sections below.

4.1.1 Total Cyanide

A determination for total cyanide encompasses free cyanide, simple cyanides and metallocyanide complexes. The most widely accepted procedure is that described in APHA (1985) and in ASTM (1984). The basic process common to both methods consists of the reflux distillation of the sample using heat, mineral acid (1:1 sulfuric acid) a magnesium chloride catalyst and low vacuum. The suggested distillation apparatus differs in the two protocols but otherwise the procedures are the same. In both protocols, the suggested measurement step for low cyanide levels is the pyridine-barbituric acid colourimetric analysis. These procedures, with little change, have been generally used over the past 10-15 years. These procedures will determine all complex cyanides except those of cobalt, gold and platinum.

The most important interference with this procedure is sulfide which can distill over and affect the color development (ASTM, 1984). This interference can be removed prior to distillation by precipitation with lead or cadmium. Also, cadmium chloride can be added to the absorbing solution to precipitate residual sulfide that distills over (Conn, 1981). Oxidizing agents (chlorine, hydrogen peroxide, ozone, etc.) are also a problem in the analysis of treated wastewaters and these interferences are removed by addition of ascorbic acid, sodium arsenite, sodium bisulfite and other reducing agents (APHA, 1985; ASTM, 1984; Conn, 1981; Kelada et al., 1984).

Conn (1981) recommends the use of hydrochloric acid and hydroxylamine hydrochloride as the reagents for acid reflux, rather than the sulfuric acid and magnesium chloride listed by ASTM (1984) and APHA (1985). This reportedly prevents the breakdown of thiocyanates which are predominant in gold mine wastewaters. With the sulfuric acid, magnesium chloride methods, very high levels of thiocyanate can break down slightly and interfere with a low level analysis for cyanide (ASTM, 1984). This has significant implications for water collected in the vicinity of mining operations.

A novel approach for the prevention of thiocyanate interference was presented by Ingersoll et al. (1981). Their method employs a 1/2 hour reflux distillation at pH 4.5 in the presence of sequestering agents and lead. The sequestering agents are used to displace cyanide from the stable complexes and thereby minimize the need for strong acid conditions and long reflux times. Recoveries of cyanide from all complexes except cobalt are good. Csikai and Barnard (1983) successfully used EDTA to displace cyanide from complexes.

The method for total cyanide was automated by Goulden et al. (1972) who utilized a thin film distillation approach. Ultra-violet light was used to accelerate the breakdown of complex cyanides, including cobalt complexes. Phosphoric acid was used in the distillation step and sodium acetate was employed as the absorbing solution. A detection limit of 0.0005 mg/L was achieved. Kelada et al. (1976, 1978, 1984) modified this procedure further to simplify some of the more difficult steps. Their method was eventually approved by the U.S. Environmental Protection Agency (Leduc et al., 1982) and formed the basis of the Technicon auto-analyser for cyanide analysis. This method is similar to that used by IWD to measure cyanide concentrations in the Prairie provinces and the Northwest Territories (cf. Section 5.1). Recoveries of various cyanide complexes are shown in Table 1.

A number of interferences were listed for this method the most serious of which are thiocyanate, nitrate/nitrite, sulfide and oxidizing agents. The latter two interferences are discussed above, with respect to the ASTM/APHA method. Thiocyanate breaks down completely under U.V. irradiation and therefore interferes on an equimolar basis. Those using this method should therefore report the result as -total cyanide plus thiocyanate (as CN). If a true total cyanide value is required, the thiocyanate should be measured separately and then subtracted.

Kelada et al. (1984) discussed the interference of various concentrations of nitrate/nitrite. For example, an addition of 50 mg/L nitrate increased the cyanide value of wastewaters by as much as 40 percent.

i.e. Raw sewage - Total CN = 0.059 mg/L
Raw sewage + 50 mg/L NO_3-Total CN = 0.10 mg/L

These authors found that the interference was more pronounced with most field samples especially when sodium arsenite was used as an anti-oxidant. Sulfamic acid was found to be effective in minimizing the interference.

The above methods all recommend a colourimetric measurement for the final analysis of low level cyanide samples. The colourimetric methods generally employ the use of chloramine-T as an oxidant followed by the formation of a polymethine pigment by a modified Konig reaction (Lambert et al., 1975). The final colourimetric reagents vary from one publication to the next but there appears to be no distinct advantage associated with any one procedure in terms of analytical sensitivity. The quoted detection limits are on the order of 0.001 to 0.010 mg/L. The original method utilized a pyrazalone-pyridine reagent (Ludzak et al., 1954). The present standard methods (ASTM, 1984 and APHA, 1985) employ a pyridine-barbituric acid reagent. This is considered to be more stable and more reactive (faster) than the pyrazalone reagent (Kelada et al., 1976). The Gold Processor's Working Group (1982) describes the use of an isonicotinic

acid - barbituric acid method that eliminates the need for using pyridine, which is a highly undesirable solvent from a health and aesthetics viewpoint.

To enhance sensitivity, Krutz (1981) performed a butanol extraction of the polymethine pigment formed from a pyridine-pyrazolone reagent. A detection limit of 0.0001 mg/L was reached by this method which is at least a tenfold improvement over the standard colourimetric analysis. This method was utilized to measure cyanide levels of 0.0001 to 0.042 mg/L in various surface water (cf. Section 3.2).

In all of the above references, the subject of sample collection and preservation is presented as a critical component in the overall analysis protocol. Preservation steps required if oxidizing agents or sulfide are present in the sample, have been discussed previously (this section). All major references recommend preservation of the samples with sodium or potassium hydroxide and storage in a dark (i.e., amber) bottle (APHA, 1985; ASTM, 1984; Conn, 1981; Kelada et al., 1984). The latter is required to minimize the photodecomposition of iron cyanides. Analysis should be performed as soon as possible after collection (immediately if possible - APHA, 1985; ASTM, 1984).

4.1.2 Simple Cyanide

The general approach taken in the analysis for simple cyanides is to decrease acid strength in the reflux step and add reagents or take additional steps to inhibit the decomposition of complex cyanides. In the method by Goulden et al., (1972) and modified by Kelada et al. (1976), U.V. irradiation is required to dissociate the complex cyanides. Without the U.V. irradiation step, only the simple cyanides are measured. A comparison of recoveries of various cyanide complexes with and without U.V. irradiation is shown in Table I.

Table 1 - Recoveries of cyanide from various complexes with and without U.V. Irradiation

Compound Tested	CN^- Concentration Prepared (mg/L)	CN Measured (mg/L)	
		Simple (without U.V.)	Total (with U.V.)
Hexacyanobaltate	0.100	N.D.	0.0990
Ferricyanide	0.100	0.0034	0.0985
Ferrocyanide	0.100	0.0036	0.0970
Tetracyanonickelate	0.100	0.0988	0.1002
Tetracyanocadmiate	0.100	0.0986	0.0985
Hexacyanomanganate	0.100	0.0985	0.1012
Thiocyanate	0.100	N.D.	0.0986

N.D. Not Detected (from Kelada et al., 1976)

The classical approach to analysis for simple cyanides was the analysis for "Cyanide Amenable to Chlorination" (APHA, 1985.; ASTM, 1985). The basis of this procedure is that complex cyanides are not dissociated by chlorination and the test is useful in designing chlorination plants for cyanide destruction. Its usefulness as an analysis for simple cyanide is limited due to a lack of precision. (Leduc et al., 1982; Ecological Analysts, 1979).

To overcome this problem the technique of weak acid-dissociable cyanide (ASTM, 1984) may be employed. The reflux is carried out at pH 4.5 and zinc acetate is added to prevent decomposition of iron cyanide. Roberts and Jackson (1971) originally presented this approach and also utilized a distillation carried out at a reduced pressure. Zinc acetate was shown to be better than lead acetate to inhibit iron cyanide decomposition. Conn (1981) reported that with the weak acid dissociable procedure, cyanide is completely recovered from zinc and nickel complexes, 70% from copper complexes, 30% from cadmium complexes, 2% from ferro-complexes and 0% from ferri and cobalt complexes.

Ion chromatography may prove to be a valuable approach to cyanide analysis since it enables the separation of various cyanide complexes and therefore distinguishes between simple and complex cyanides. (Dionex, 1984). At this stage, a great deal of development work would be required to confirm the usefulness of this method. It lacks sensitivity and in our opinion would be applicable only to wastewaters or waters containing high cyanide levels. If ion chromatography were used, it would be necessary to also perform analyses for simple and total cyanides by more traditional procedures after the separation steps.

4.1.3 Free Cyanide

In the analysis for free cyanide, the objective is to measure only the HCN and CN- present in the sample at the time of analysis. Clearly some simple cyanides will be measured as well, because of their ability to dissociate.

Some researchers have carried out a colourimetric analysis directly on the sample (without distillation). This approach is, however, prone to serious interferences especially from thiocyanate (Kelada et al., 1976).

Scheider and Freund (1962) developed a gas-chromatographic method with a thermal conductivity detection system. The method was sensitive to about 0.025 mg/L. Various substances were shown to interfere including amines and hydrogen sulfide. The method was modified by Claeys and Freund (1968) using a flame ionization detector and a different chromatography column. This approach achieved a detection limit of 0.001 mg/L.

Specific extraction procedures have also been presented as a means for measuring free cyanide. Montgomery et al. (1969) utilized trichloroethane for extraction and reported detection limits of 0.01 mg/L. Wronski (1984) complexed HCN with tributyltin and extracted the complex with trichloroethylene. The resulting extract was back extracted with sodium hydroxide and this solution was analysed by

titration with silver nitrate. The reported detection limit was 0.004 mg/L which might have been improved had a colourimetric method been used for final measurement.

An electrochemical approach to free cyanide analysis was reported by Nelson and Lysyj (1971) and by Leung and Bartak (1981). The methods appear to be specific and sensitive but the analysis is tedious and not readily amenable to automation.

A gas dialysis method was described in which the sample is acidified and the released hydrogen cyanide passes across a gas permeable membrane where it is absorbed in an alkaline indicator solution (Durst, 1977). The primary interfering substance was shown to be ferrocyanide and its presence necessitates the use of a "correction factor" in the final calculation.

A diffusion method was described by Ricotta (1975). This method employs a Conway micro-diffusion cell that contains two chambers -one for the sample and the other for an absorbing solution. The determination of free cyanide in water by microdiffusion is now an ASTM procedure (ASTM, 1985). The sample (3.0 mL) is treated with cadmium to precipitate hexacyanoferrates, and is then buffered at pH 6 and allowed to stand for 4 hours. The HCN diffuses into a sodium hydroxide solution which is then analysed colourimetrically using the pyridine-barbituric acid method. The method is sensitive to 0.010 mg/L.

Broderius (1981) describes a diffusion method that allows the use of larger sample aliquots (up to 1.5 liters) thereby achieving a lower detection limit of 0.001 mg/L. Various simple cyanides and complex cyanides were tested as shown in Table 2.

Table 2 - Determination of HCN by the diffusion procedure for phosphate-buffered cyanide solutions at 20°C and containing complexing metals

Test Solution[a]	pH Value	Amt of Total Cyanide Present (as HCN) mg/L	HCN Concn. Determined mg/L
$ZnSO_4$ + 4NaCN	7.35	0.0253	0.0243
$CdSO_4$ + 4NaCN	7.50	0.0247	0.0201
$Pb(NO_3)_2$ + NaCN	7.50	0.0264	0.0260
$K_4Fe(CN)_6$	7.72	1.000	0.0017
$K_4Fe(CN)_6$ + 25 mg/L HCN	7.74	1.025	0.0259
$K_3Fe(CN)_6$	7.74	1.000	0.0015
$K_3Fe(CN)_6$ + 25 mg/L HCN	7.74	1.025	0.00257
$AgNO_3$ + 2NaCN	7.68	0.0500	0.00463
$AgNO_3$ + 2NaCN	7.43	10.000	0.0140
$NiSO_4$ + 4NaCN	7.07	5.000	0.149
$NiSO_4$ + 4NaCN	7.06	10.000	0.154

[a] Iron cyanide solutions were shielded from light.

(from Broderius, 1981)

4.1.4 Summary

- Numerous methods of cyanide analysis have been presented in this section. The most widely used methods employ three basic steps-

  1. separation of the cyanide from the sample matrix as HCN
  2. trapping the HCN in an absorbing solution
  3. analysis of the trapped HCN.

- The best sensitivity is obtained by the pyridine-barbituric acid or pyridine-pyrazalone colourimetric measurement; Krutz (1981) described an extraction to enhance this sensitivity by a factor of 10.

- Other analytical approaches include
  - gas chromatography
  - ion chromatography
  - electro-chemical
  - gas diffusion

  but insufficient data were available to allow comments concerning their potential for routine use. None of these methods have been accepted by ASTM or by the APHA.

- Analytically, it is difficult to accurately categorize cyanides present in water or wastewater as total, simple or free cyanide. There can be considerable overlap among these groups and there is insufficient information in the literature to comment concerning the behavior, in the described analyses, of various cyanide compounds. However, many of the methods appear to offer a reasonable categorization of total, simple and free cyanide.

- The most widely accepted method for total cyanide analysis is that described in ASTM (1984) and APHA (1985). An automated version was described by Kelada et al. (1976) and with some modifications formed the basis for generally accepted auto-analyser methods approved by the U.S. EPA.

- An accepted method for simple cyanides is that described by Kelada et al. (1976) but without U.V. irradiation. Without the U.V. step, complex cyanides are not dissociated. A good alternate (non-automated) is the analysis for weak acid dissociable cyanide (ASTM, 1984).

- ASTM (1985) has accepted a microdiffusion method for free cyanide. Broderius (1981) described a similar diffusion method that can attain a better limit of detection than the ASTM method.

- Further discussions pertaining to the method used to produce the data under review and recommendations for future monitoring are provided in Sections 5.1, 6.2 and 7.0.

4.2 Quality Assurance Requirements for Low Level Analyses

Quality assurance is now an integral part of laboratory management. Until the late 1960's however, there was only limited official recognition of the need for quality assurance (QA) in environmental work. In the United States a national QA laboratory was established in the 1970's that eventually came under the control of the U.S. Environmental Protection Agency (EPA). The EPA published the "Handbook for Analytical Quality Control in Water and Wastewaters" which has since undergone numerous revisions (Kirchmer et al., 1983). Numerous other reviews that provide an excellent perspective on quality assurance have been recently published (e.g., Youden & Steiner, 1975; Amore, 1979; Glaser et al., 1981; Taylor, 1983, 1985 a,b).

The U.S. EPA define Quality Assurance (QA) as "the total program for assuring the reliability of monitoring data". Quality Control (QC) is limited to "the routine application of procedures for controlling the measurement process". QC is primarily concerned with the tools of the measurement system. Reagents should be of the highest quality and checked for purity, strength, deterioration with time, and contamination. Class A volumetric glassware should be thoroughly cleaned and calibrated when necessary. Balances should be frequently checked with certified weights and records kept. All instruments should be calibrated on a routine basis, with the maintenance of appropriate standards and operation logs on performance.

The QA program includes the analysis of quality assurance samples (as discussed below) to define the precision and accuracy of the method for the type of sample under investigation. Precision and accuracy are defined as follows:

Precision - is the degree of agreement of repeated measurements, usually expressed in terms of the scatter of test results about the mean of all the determinations (i.e., standard deviation or a confidence interval). The best way to determine the precision of an

analysis is to carry out repeated measurements on a homogeneous sample and then calculate the standard deviation. Precision can also be determined from a series of pairs of duplicate measurements. The Coefficient of Variation (CV) is an alternate way of expressing precision, and is calculated as

$$CV = \frac{\text{standard deviation of n determinations}}{\text{mean of n determinations}} \times 100$$

Accuracy - refers to the agreement between the amount of a component measured by the test method and the amount actually present. Accuracy is best determined using a certified standard with a known analyte concentration. The difference between the concentration found and the certified value is then expressed as the relative percent error. An alternate method to verify accuracy is to add a known amount (spike) of the substance being measured to a regular sample or blank and determine the percent recovery. This actually determines apparent accuracy until further validation is carried out with round-robin programs involving other laboratories.

The general relationship between analytical approaches for quality assurance is shown in Figure 3.

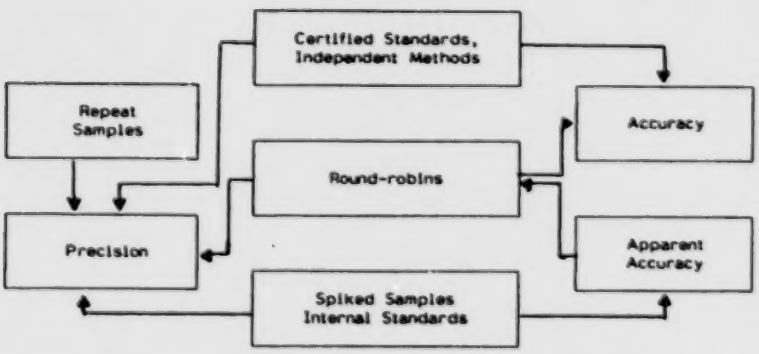

Figure 3 Measurement of precision and accuracy of an analysis (from Amore, 1979)

A QA protocol must also take into account the question of contamination both in the field and in the laboratory and must also consider other problems that may be associated with sample collection.

Most well managed laboratories usually devote at least 20 percent of their effort to quality assurance. The quality assurance protocol should be developed on the basis of the type of samples submitted and anticipated concentrations of the analyte under investigation. The discussions below pertain to a general quality assurance program designed to validate data for low concentrations of an analyte in relatively clean surface waters. As such, the protocol should be directed towards validating the detection limit, defining the precision and accuracy of the method near this detection limit, and assuring that contamination (field or laboratory) is not a factor.

4.2.1 Definition of Detection Limit

Environmental analytical chemists have not universally agreed upon a convention for determining and reporting the lower detection limits of analytical procedures. Values reported as lower detection limits are commonly based on instrumental sensitivity, levels of blank contamination, and/or matrix interferences and have various levels of statistical significance. The American Chemical Society's Committee on Environmental Improvement (CEI) defined the following types of detection limits in an effort to standardize the reporting procedures of environmental laboratories (Keith et al., 1983):

- Instrument Detection Limit (IDL) - the smallest signal above background noise that an instrument can detect reliably. Confusion often arises when IDL's are reported as method detection limits.

- Limit of Detection (LOD) - the lowest concentration level that can be determined to be statistically different from the blank. The recommended value for LOD is 3 S.D., where S.D. is the standard deviation of the blank in replicate analyses.

- Limit of Quantitation (LOQ) - the level above which quantitative results may be obtained with a specified degree of confidence. The recommended value for LOQ is 10 S.D., where S.D. is the standard deviation of blanks in replicate analyses. The LOQ tends to be a conservative estimate for reporting of results and may necessitate the rejection of valid data.

- Method Detection Limit (MDL) - the minimum concentration of a substance that can be identified, measured and reported with 99 or 95 percent confidence that the analyte concentration is greater than zero.

The latter definition (MDL) is perhaps a more realistic approach to calculating a detection limit since it is based on a complete analytical procedure, includes matrix effects, and is derived from the analysis of samples or standards rather than blanks. The calculation of MDL is fully discussed by scientists from the U.S. EPA (Glaser et al., 1981). The first step involves estimating the MDL using the following guidelines:

- concentration value that corresponds to 2.5 - 5 times the signal/noise ratio of the instrumentation
- concentration value that corresponds to 3 times the standard deviation of replicate analysis of the blank (this is equivalent to LOD)
- concentration value that corresponds to known instrumental limitations

After this, a series of replicate samples (or standards or spikes) are analysed. The selected samples should have a concentration of analyte that is one to five times the estimated MDL. The MDL is then calculated as follows:

$$MDL = t \times SD$$

Where t = student's t-value for a one-tailed test at the 99% confidence level with n - 1 degrees of freedom

SD = standard deviation of the replicate analyses

The paper by Glaser et al. (1981) describes calculations to establish a confidence interval for the MDL and an iterative procedure for determining the reliability of the MDL.

This definition of MDL is valuable from an operational standpoint because it is based on the analysis of samples or standards containing analyte. The MDL should be confirmed over a period of time by using data from the low level standard analyses as discussed in Section 4.2.3.

4.2.2 Quality Assurance Samples

Quality assurance samples are used in the laboratory to define precision, accuracy and contamination control. These samples can be submitted either as known samples to the analyst or as blind samples. If submitted blind, the data become more useful since the target values are not known at the time of analyses. For trace analyses, the following quality assurance samples are commonly employed:

- Method Blank - usually distilled water with added reagents, which is carried through the entire analysis as a check on laboratory contamination (also called a reagent blank).

- Transportation Blank - distilled water that has been transported to the point of sample collection and treated as a sample (i.e., field prepared and preserved). It is then transported back to the laboratory and analysed along with the samples as a check on field contamination.

- Duplicate - a homogenous sample is split either in the field or in the laboratory with the duplicate presented to the analyst as an additional sample to check for precision. If more than two splits are analysed the term replicate is normally used. It is best to use a filtered sample for replicate analyses such that homogeneity can be assured.

- Check Standard - a procedure is standardized with calibration standards prior to analysing the samples. The analytical response to the standards should be checked by frequently analysing one or more standards along with the samples. The check standards should be prepared independently of the calibration standards.

- Spike - a known amount of analyte is added to a sample to provide information on matrix effects and apparent accuracy.

- Standard Reference Material - a material that contains a known concentration of the analyte in question. Based upon reliable documentation of the analyte concentration, a reference material is certified by agencies such as the National Bureau of Standards.

The use of such quality assurance samples for a trace analysis program is discussed below.

4.2.3 Recommended Quality Assurance Approach

The analytical program discussed in this report involves the analysis of surface waters (most of which are relatively "clean") for low levels of cyanide. This is a typical trace contaminant monitoring program and the recommended QA approach is noted below.

Contamination Control - is extremely important when dealing with levels at or near the limit of detection. The most important aspect of such control is cleanliness of containers, glassware and reagents, and maintenance of instrumentation to ensure a stable baseline. Contamination control is checked by the analysis of:

- method blanks (or reagent blanks) which consist of distilled water that is processed through the entire laboratory procedure - at least 10%
- transportation blanks (or field blanks) which consist of distilled water that is transported to the field and handled (i.e., filtered, preserved) in the same manner as the samples - at least 1 or 2 per sample submission.

For the latter it is recommended that reagent grade water is transported to the field and then transferred to a sample container and preserved in the same manner as the samples. At least one transportation blank should accompany every shipment of samples to the laboratory.

Detection Limit - should be validated on a frequent (e.g., monthly) basis. Using the calculation shown in the previous section, this can be determined from the data on the low level standard.

Precision of Method - should be established with regularity depending on projects. If most of the levels encountered are near the limit of detection then the quality assurance samples should be at comparable concentrations. For instance, if the detection limit is 0.001 mg/L and most of the encountered levels are below this or just above, then the recommended quality assurance standards would be 0.002 mg/L and 0.010 mg/L for the following reasons:

0.002 mg/L to ensure the capability of the method to maintain sensitivity at this level. Data from the analysis of this standard can also be used to calculate the detection limit (MDL).

0.010 mg/L to ensure precision at a level that would be considered elevated and of possible environmental concern.

These standards should be prepared independently of the calibration standards to provide a truly independent check.

In our opinion, the recommended frequency of these check analyses should be at least five percent for each of those standards (i.e., one 0.002 mg/L standard and one 0.010 mg/L standard with each batch of 20 samples). Control charts should be maintained on these standards and a tolerance limit established. For instance, it is normal to simply plot the measured values of a standard on a chart in which 2 S.D. is the warning limit and 3 S.D. is the action limit (Figure 4). If a method is particularly precise, these limits may be lowered to 1 S.D. and 2 S.D.

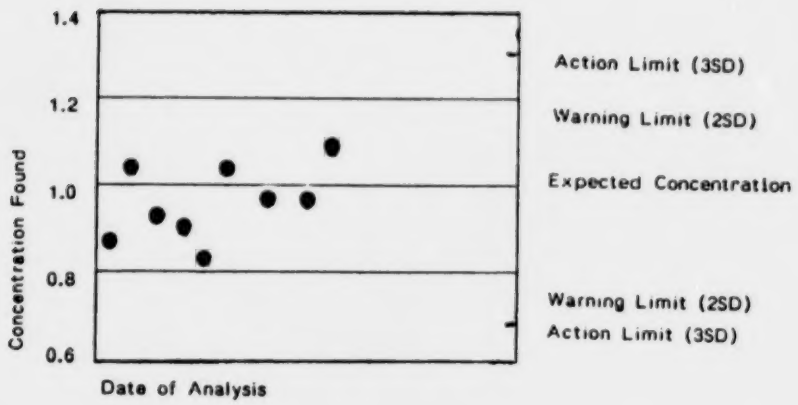

Figure 4 - Example of a precision and accuracy control chart based on the analysis of a synthetic standard prepared independently from the calibration standards.

The basis of the control charts' limits should be a precision determination carried out with replicate analyses of various standards and low level samples. In our opinion, the method precision should be initially determined by analysis of about twenty 0.002 mg/L standards and twenty 0.010 mg/L standards and replicate aliquots of a sample containing comparable concentrations.

Accuracy of Method - the use of correctly and independently prepared check standards for precision measurements will also establish apparent accuracy. Accuracy can be further checked by spiking samples with low concentrations of the analyte. Spiking is especially valuable if matrix interference is suspected. For instance, if a series of water samples are found to contain high dissolved solids, then a matrix effect may be possible. In such a case, at least ten percent of these samples should be re-analysed with an added spike. The level of spike should be near the detection limit (i.e. two to ten times the method detection limit).

The best way to validate accuracy is to analyse a certified reference material closely matching the sample matrix. However, water samples are not generally available as reference materials especially for analysis of volatile or easily degraded contaminants such as cyanide. It is possible, however, to obtain concentrates containing known levels of cyanide. These should be used whenever possible. Once opened, the extract must be diluted and analysed immediately. Thus, it is best to pre-plan a definite program to maximize the information derived from the analysis of these extracts.

Blind Check Samples - most of the quality assurance samples discussed above are known to the analyst. In theory, extra treatment could be given to these samples although this is unlikely, given that most analysts are aware of the importance of treating these samples in a normal fashion. Even so, blind checks should be added by both the field personnel and the laboratory supervisor as follows:

Field personnel	- submit blanks and duplicates. Usually do not have facilities to prepare spikes and standards.
Laboratory supervisor	- submit blanks, duplicates, spikes and standards

These QA solutions should be labelled as samples.

Flagging - it is important to validate values that fall outside the expected concentration of a particular site. Once a batch of samples has been analysed, the data should be examined, and any values above a specified level should be rechecked to verify the result obtained. The fact that the result was verified should be recorded along with the data point.

Interlaboratory Studies - a final step that should be taken as a quality control measure is participation in interlaboratory calibration programs.

In summary, a QA protocol has been presented that, if managed properly, will validate data for true levels of a parameter in relatively clean waters. This program is summarized in Table 3.

In addition to this daily QA procedure it will be necessary to periodically:

- confirm precision by analyses of replicate standards and samples
- confirm detection by calculations with low level standard data
- confirm accuracy by analysis of reference materials (if available) and by participation in interlaboratory calibration programs.

Table 3 - Summary of recommended QA program for trace analysis (for each analysis day for each batch of 50 samples)

Type of Sample	Number per Batch run
Samples	50
Method Blanks	4
Transportation Blanks	2
Low Level Standard (0.002 mg/L)	2
Mid Level Standard (0.010 mg/L)	2
Spike (0.005 mg/L)	2
Duplicates	5

5.0 CYANIDE LEVELS IN SURFACE WATERS FROM THE PRAIRIE PROVINCES AND THE NORTHWEST TERRITORIES

5.1 Laboratory Methodology Used

The IWD carried out total cyanide analyses using an automated procedure similar to that described by Kelada et al. (1976) as discussed in Section 4.1.1 of this report. The methodology is summarized as follows:

- Automated Pyridine - Pyrazalone Method for Cyanide (Naquadat No. 06604)
- Complex cyanides are decomposed by irradiation with U.V. light
- Phosphoric acid is used in the distillation step
- The HCN generated by the U.V. irradiation and refluxing, is distilled into a sodium acetate absorbing solution
- The colourimetric reaction is carried out using chloramine-T and pyridone-pyrazalone reagents.

This procedure is slightly different from that used by IWD - Pacific & Yukon Region which is referred to as the "automated pyridine-barbituric acid" method (Naquadat 06606).

With the latter method, simple cyanides are differentiated from total cyanides by a dual channel auto-analyser. In the second channel, U.V. irradiation is blocked thereby preventing the decomposition of complex cyanides. Other differences in the method include the use of hypophosphorous acid in the digestion step, phosphate buffer absorbing solution (rather than sodium acetate) and the pyridine-barbituric acid reagent is used for the final colourimetric determination.

With both methods the common interferences include:

Positive

- sulfide (above 1.0 mg/L)
- thiocyanate (on an equimolar basis)
- nitriles (may decompose under test conditions) and certain steam distillable organics
- nitrate (20 ppm NO_3 can give an apparent CN of 0.004 - 0.005 mg/L) (F. Mah, IWD, pers. comm.)
- substances that are normally removed by distillation including heavy metal ions, fatty acids, coloured complexes.

Negative

- substances such as chlorine and sulfur dioxide may oxidize the free cyanide and also some complex cyanides (cf. Section 4.1.1).

As a general statement, it is felt that these interferences are not a factor in the analysis of relatively clean surface waters. However, it is important to recognize that thiocyanate is included in the analysis for total cyanide.

The precision of the Naquadat 06604 method was evaluated internally by IWD by analysis of 10 aliquots of a 0.001 mg/L standard and 10 aliquots of a 0.005 mg/L standard (J. Gaskin, IWD, pers. comm.). These were placed randomly throughout two trays and analysed with field samples. The results obtained were as follows:

	Mean (ug/L)	Coefficient of Variation (%)
1.0 ug/L standard-	1.3	18.7
5.0 ug/L standard-	5.4	8.5

The detection limit has been defined as twice the baseline noise on the chart recorder and is presently listed as 0.001 mg/L. The procedure is usually calibrated with standards that range from 0.001 mg/L

to 0.070 mg/L. A flagging system was used for any result above 0.50 mg/L. Comprehensive quality assurance data on check standards, duplicates, interlaboratory results, blanks and spikes during the study period were not available for review.

5.2 Data Processing Methodology

The Naquadat data base was received from the Inland Waters Directorate's Water Quality Branch in Ottawa on magnetic tape in the Naquadat 05 format. The tape (WQU001) is 9-track, 1600 bpi, unlabelled, EBCDIC coded with 60,982 80-character records in blocks of 4800. All water quality data collected with each of the Western and Northern Region samples analysed for cyanide, were provided on several records, each with up to four parameter codes and their respective values.

The data base was down-loaded from tape to the IBM VM-370 main-frame computer at the University of Victoria and summarized and analysed using the Statistical Analysis System (1982 version). Sample information was reduced to include the following parameter values contained in a single 80-character record.

Parameter	Naquadat Code
Station No.	--
Date	--
Time	--
Cyanide	06604
Temperature	02065, 02061, 02062, or 02066
pH	10300, 10301, 10302, or 10304
Conductivity	02041, 02042, or 02051

Only field estimated values for pH, temperature, and conductivity were included in the subsequent data summaries.

For each of the 3,481 samples, cyanide data were summarized by treating each measurement, taken at different times over a number of years, as a replicate observation. All values below detection were considered zeros. The data were summarized to provide the following information:

- total number of observations (n)
- mean of all measurements (with a standard error)
- minimum and maximum values
- frequency of detection over 0.005 mg/L (plus mean, minimum and maximum)
- frequency of detection over 0.030 mg/L (plus mean, minimum and maximum)

The basis of the 0.005 and 0.030 values is discussed in Section 3.3.1. This data summary is presented as Appendix I.

Field temperature, pH, and conductivity measurements were also summarized as above. This information is presented as Appendices 2, 3 and 4 respectively.

Originally proposed data analysis procedures included use of parametric or non-parametric comparison statistics in order to establish differences in cyanide levels between stations and over time. While such statistics are appropriate in studies which either document effects of external or influential variables or minimize differences in these variables (e.g., sampling at same time of year, etc.), they can produce very misleading results if employed in situations which do not account for such variables. In the case of the accumulated cyanide data, many of the criteria which should be considered in order to implement such statistical procedures were not achieved. Variability in the estimates of parameter values (e.g., standard deviations of measured cyanide concentrations) could not be reported, as sample replication was not performed for any of the survey periods. Changes in sampling and analytical methods (e.g., detection limit changes) between surveys was also difficult to account for and use of such

data in rigorous statistical procedures could bias interpretation of results using no replication.

Use of an appropriate multivariate technique such as discriminant function analysis was also proposed initially. In addition to the problems mentioned above, use of such a technique on these data would have produced inconclusive results. High seasonal and annual variability in cyanide levels between 0 and 0.01 mg/L with incidental sample disjunctions represented by very high levels would have obscured probable relationships between cyanide levels and any of the other measured abiotic variables.

A data summary and graphical data presentation was the most appropriate method by which to extract and portray information on cyanide concentrations both spatially and temporally. Data summaries on the basis of biologically sensitive concentrations were useful in documenting areas of concern.

5.3 Identification of Significant Sites

Upon review of the data summary (shown in Appendix I) it was clear that some of the sites had significant concentrations of total cyanide in terms of frequency of detection above 0.005 and 0.030 mg/L, and/or mean concentrations. Criteria were established to identify such sites and differentiate them from numerous other sites that generally showed low levels of cyanide.

Significant sites were selected based on two criteria: adequate number of measurements for determining site characteristics, and frequency of occurrence of values of potential biological concern. The basis for this selection is outlined in Figure 5, and described in the following pages.

Unless a total of 10 or more measurements had been made at a site, the data base was considered insufficient to characterize that site. However, if any total cyanide values greater than 0.030 mg/L occurred at such sites, the date at which they occurred was checked to compare with possible seasonal trends in the full data base. As previously noted (cf. Section 3.3), assuming that all of the total cyanide measurements were equivalent to free cyanide, fish kills would be expected to occur at a concentration of 0.030 mg/L. However, fish kills for reasons other than low dissolved oxygen have not been recorded at any of the Prairie province sites (J. Gaskin, IWD, pers. comm.).

Those sites for which 10 or more measurements had been made were further subdivided based upon frequency of detection over 0.005 and 0.030 mg/L. As previously noted (cf. Section 3.3), assuming that all of the total cyanide measurements were equivalent to free cyanide, sublethal biological effects would be expected to occur at a concentration of 0.005 mg/L. Since natural total cyanide levels may reach or exceed 0.005 mg/L (cf. Section 3.2), only sites which showed a consistent elevation of total cyanide levels above 0.005 mg/L (i.e., more than 20% of the measurements) were considered in detail. However, if any total cyanide values greater than 0.030 mg/L occurred at sites which did not show a consistent elevation above 0.005 mg/L, the date at which such values occurred was checked to compare with possible seasonal trends in the full data base.

In using these criteria, 77 sites (out of a total of 163) were identified for further investigation. These sites were summarized by region (i.e., Alberta, Saskatchewan, Manitoba, Northwest Territories) in a series of tables. The tables are presented together (see Tables of Significant Sites) and show site number and name, detection frequency over 0.005 mg/L (as percent, mean, minimum and maximum), and detection frequency over 0.030 mg/L (as percent and mean).

Seasonal trends in cyanide concentrations were examined subjectively by manually plotting all the cyanide data at selected sites against time of collection. The sites plotted were those with the greatest data base, and included all those from the prairie provinces with more than 50 cyanide measurements and all those from the Northwest Territories with more than 30 cyanide measurements.

- 5 from Alberta
- 6 from Saskatchewan
- 7 from Manitoba
- 2 from Northwest Territories

These plots are presented in "Figures of Significant Sites".

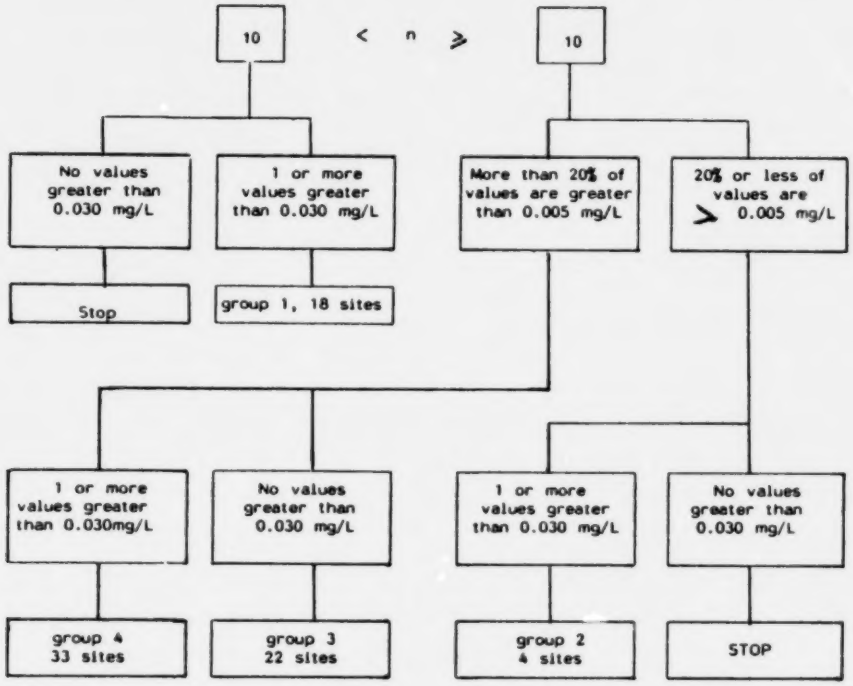
10
< n ≥
10
No values greater than 0.030 mg/L
1 or more values greater than 0.030 mg/L
More than 20% of values are greater than 0.005 mg/L
20% or less of values are ≥ 0.005 mg/L
Stop
group 1, 18 sites
1 or more values greater than 0.030mg/L
No values greater than 0.030 mg/L
1 or more values greater than 0.030 mg/L
No values greater than 0.030 mg/L
group 4 33 sites
group 3 22 sites
group 2 4 sites
STOP

Figure 5 Criteria for identification of significant sites. n = number of measurements at each site.

6.0 RESULTS AND DISCUSSION OF SUMMARIZED DATA

6.1 Description of Summarized Data

Two different types of data summary are provided. In Appendices 1-4, summary statistics are provided for each station in terms of total cyanide values and three ancillary parameters measured in the field: temperature, pH and conductivity. These three ancillary parameters may all affect cyanide toxicity (cf. Section 3.3.2).

The cyanide data were further summarized by selecting significant sites and presenting seasonal data for some of them. These summaries are presented separately in this report as:

Tables of Significant Sites (pp. 54-70)
Figures of Significant Sites (pp. 71-80)

6.2 Discussion of Analytical Methods

The cyanide measurements under review were carried out between 1974 and 1983 by the Inland Waters Directorate. The laboratory was originally located in Calgary and later moved to Saskatoon. The methodology used was consistent throughout this time frame but the data base showed that the detection limit was changed from 0.005 to 0.001 mg/L in 1978.

Although laboratory blanks and standards were frequently analysed, and corrective action taken when analysis problems were observed, determination of precision and accuracy statistics were not consistently carried out. This was particularly evident for concentration levels at or near the total cyanide detection limit. The absence of these precision and accuracy statistics prevented a full evaluation of the validity of those results occurring in the region of the detection limit. In addition, precision and accuracy data, on transportation blanks would have allowed definite statments to be made concerning control of contamination during collection and preservation.

6.3 Toxicological Significance

The toxicological significance of the data reviewed is difficult to assess, as total cyanide measurements are not necessarily of toxicological significance. The potential effect of temperature, pH and conductivity on cyanide toxicity is discussed below. The range of variation of each of these parameters, and of the total cyanide measurements, is dependent on the number of measurements taken at a site, and the seasonality of such measurements.

Temperature values varied from a high of 28C to a low of 0C (Appendix 2). Temperature can have a bi-phasic effect on cyanide toxicity such that low concentrations of cyanide are more toxic at lower temperatures than at higher temperatures, while high concentrations of cyanide are more toxic at higher temperatures than at lower temperatures. Highest temperatures were recorded, as expected, in the summer, and lowest in the winter. However, total cyanide values were extremely variable (cf. Figures of Significant Sites) with no set seasonal component, such that temperature values could not be used to predict potential changes in toxicity.

Measured pH values varied from pH 10.2 to pH 5.9, with most values between pH 6 to 8 (Appendix 3). Within the range of pH 6-8, no effect on free cyanide toxicity would be expected. At pH ranges of 9.5 and above, pH effects alone would be expected to cause fish mortalities. However, since this study was concerned solely with cyanide effects, potential seasonal or regional trends in elevated pH values were not investigated.

Measured conductivity values varied from less than 10 to 4,345 umhos/cm (Appendix 4). Within the above range, no effect on cyanide toxicity would be expected.

6.4 Comparison to Natural Levels

Natural background levels of total cyanide have not been well established, but may range to 0.060 mg/L (cf. Section 3.2). Generally, few values recorded in Manitoba, Alberta or Saskatchewan exceeded this level. However, in the Northwest Territories most values far exceeded this level. This difference between the regions is attributable to the fact that sites measured in the Northwest Territories generally represent areas where active mining is occurring, while sites in the other three regions are not subjected to major anthropogenic cyanide inputs (J. Gaskin, IWD, pers. comm.).

6.5 Regional and Seasonal Trends

As is apparent from the Figures of Significant Sites, there are no apparent seasonal trends at any of the sites or regions. A similar lack of seasonality was apparent when data for the ungraphed sites were reviewed. As discussed above, there are major differences in cyanide concentrations between the Northwest Territories and the other three regions, which are attributable to industrial activity at the sites chosen for measurement. All the Northwest Territories sites are mine wastewater or downstream from mining activities and cyanide release at these sites would be expected.

Of the other three regions, Manitoba had the highest percentage of cyanide values over 0.005 mg/L and 0.030 mg/L as shown in Table 4. Saskatchewan and Alberta had much lower percentages of these higher total cyanide values.

Table 4 - Comparison of total cyanide values in each region

Station	n	n > 0.005 mg/L	n > 0.030 mg/L	Max. Value mg/L
Alta	1069	178 (16.7%)	10 (0.9%)	0.060
Sask.	1271	309 (24.3%)	17 (1.3%)	0.092
Man.	828	393 (47.5%)	29 (3.5%)	0.510
N.W.T.	313	230 (73.5%)	197 (62.9%)	79.

n = Total number of cyanide measurements in each region

The significance of these regional differences is not known. Preliminary information concerning each site was gathered and in general all sites in these three regions were in areas that would be affected by one or more of the following (J. Gaskin, IWD, pers. comm.):

- agriculture
- forestry
- highways
- industry (but not known cyanide users)
- urban development

In summary, none of the Prairie province sites would be considered pristine nor would they be considered heavily industrialized. There is no evidence to suggest any reason for the Manitoba sites to have more elevated cyanide levels than the other Prairie provinces. The possibility of nitrate interference causing elevated cyanide values was ruled out as a factor. Nitrate/nitrite concentrations in the Prairie province sites ranged from 0 to 1.6 mg/L (J. Gaskin, IWD, pers. comm.) which is not sufficiently high to interfere significantly with cyanide measurements (cf. Sections 4.1.1 and 5.1).

To comment further as to possible sources of cyanide and reasons for site differences would require a more detailed examination (i.e., review of charts, discharges, flow information, seasonal changes, history) of each site. This would be a major undertaking and would necessitate broadening the scope of this study.

7.0 CONCLUSIONS AND RECOMMENDATIONS

- Cyanide-containing compounds occur throughout the environment and may be attributed to both natural and man-made sources.

- It is difficult to compare various data bases because results obtained are often dependent upon the analysis method used to carry out the measurements. For instance one data set may include thiocyanate reported as cyanide while another may not.

- Natural total cyanide levels as high as 0.060 mg/L have been recorded. However the determination of true natural background is partly mediated by the analytical techniques used (see above statement).

- Toxicological effects are primarily attributable to free cyanide (molecular HCN and CN-). There is no established relationship between free and total cyanide values.

- From a review of the literature, free cyanide levels between 0.005 and 0.030 mg/L were established as concentrations of biological concern

  0.005 mg/L - beginning of impairment (sublethal) for sensitive species

  0.030 mg/L - beginning of lethal effects.

- Free cyanide toxicity is affected by temperature but not by normal fluctuations in conductivity, pH and hardness. However pH can greatly affect total cyanide toxicity due to its effect on dissociation of the cyanide complexes to form free cyanide.

- A high percentage of the total cyanide measurements carried out on water samples collected from the Prairie provinces and the Northwest Territories (1974 to 1983) were above 0.005 mg/L and many results were also above 0.030 mg/L. A lack of quality

assurance records accompanying these results prevented a full discussion on the validity of the data. The analysis method also measures thiocyanate.

- The sources of cyanide are known for the Northwest Territory sites and are related to mining operations where cyanide use is prevalent.

- The sources of cyanide are not known for the other sites. The sites are not considered pristine, nor are they located in heavily industrialized areas.

- The toxicological significance of the measured values could not be discussed since the analyses were for total rather than free cyanide.

- In future studies it is recommended that the analytical protocol include the analysis for free or simple cyanide as well as total cyanide. The most cost effective approach to achieve this goal would probably be the use of a dual channel auto-analyser with the second channel devoted to simple cyanide analysis by missing the U.V. irradiation step (cf., Sections 4.1.2 and 5.1). The Naquadat method 06606 utilizes this approach and is a more updated procedure than that used to generate the data in this study.

- It would be useful to determine the behaviour of various cyanide compounds (free, simple and complex cyanides plus thiocyanate) in the method adopted. It would also be important to fully document the effect of common interferences including nitrate, nitrite, sulfide, and oxidizing agents.

- A comprehensive quality assurance program is recommended similar to that discussed in Section 4.2.3 which includes:

- an initial validation of the method and a determination of detection limit
- a continual program to confirm precision, accuracy, detection limit and effective control of contamination
- a flagging system for elevated values. A cyanide concentration of 0.020 or 0.030 mg/L would be the recommended flagging level.

In terms of number of samples, this program could approach an increase of 40% (of additional QC samples) but in terms of actual work load, this represents an additional effort of only about 20%.

o It is further recommended that the data produced be continually monitored by the field personnel to identify deviations from the norm. In this way additional tests could be done if elevations are noted.

o A final recommendation is to collect cyanide samples in amber bottles, preserve with sodium hydroxide to pH above 12.0, carry out the analyses as soon as possible after collection and perform QA/QC tests on transportation blanks.

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TABLES OF SIGNIFICANT SITES

Key - Site identification gives the Inland Waters Directorate NAQUADAT number and the site Name. The number in paranthesis is the group number according to the criteria discussed in Section 5.3. and Figure 5: (4 = most significance, 1 of least significance).

n = number of measurements
mean is expressed as quantity ± standard error, or quantity only.

SUMMARY OF SIGNIFICANT SITES - ALBERTA

SITE IDENTIFICATION	N	Detection Over 0.005 (mg/L)				Over 0.03 (mg/L)	
		% Freq.	Mean	Max	Min	% Freq.	Mean
OOAL06AD0001 (4) Beaver River at Beaver Crossing, Alta	118	28.8	0.0126 ± 0.0014	0.043	0.006	1.7	0.038 ± 0.0050
OOAL07BB0003 Pembina River at Entwistle, Alta (1)	9	33.3	0.0197 ± 0.0102	0.04	0.009	11.1	0.04
OOAL07BE001 (3) Athabasca River at Athabasca, Alta	10	30.0	0.0093 ± 0.0015	0.012	0.007	0	-
OOAL07CD0001 Clearwater River Above Fort McMurray, Alta (3)	11	27.3	0.0110 ± 0.0021	0.014	0.007	0	-
OOAL07DA0001 (3) Athabasca River at Fort McMurray Alta.	11	36.4	0.0072 ± 0.0008	0.009	0.006	0	-
OOAL07DA0003 (4) Athabasca River at Fort McKay, Alta	13	38.5	0.0112 ± 0.0050	0.034	0.0080	7.7	0.034

SUMMARY OF SIGNIFICANT SITES - ALBERTA

SITE IDENTIFICATION	N	Detection Over 0.005 mg/L				Over 0.03 mg/L	
		% Freq.	Mean	Max	Min	% Freq.	Mean
OOAL05AA0005 Oldman River near Waldron's Corner (3)	11	36.4	0.0097 ± 0.0009	0.012	0.008	0	-
OOAL05AE0001 St. Mary River Near Int.Boundary(2)	82	6.1	0.0132 ± 0.0057	0.036	0.006	1.2	0.036
OOAL05AG00D1 Oldman River at Hwy 36, N. of Taber (4)	10	30.0	0.0233 ± 0.0173	0.058	0.006	10	0.058
OOAL05AK0001 South Saskatchewan River at Hwy 41, Alta. (2)	118	17.8	0.0119 ± 0.0013	0.031	0.006	0.85	0.031
OOAL05BJ0003 Elbow River at Bragg Creek, Alta (4)	10	30.0	0.0123 ± 0.0033	0.017	0.006	0	-
OOAL05CK0001 Red Deer River at Blind Loss, Alta (2)	120	19.2	0.0162 ± 0.0035	0.07	0.006	1.6	0.0655 ± 0.0045

SUMMARY OF SIGNIFICANT SITES - ALBERTA

SITE IDENTIFICATION	N	Detection Over 0.005 mg/L				Over 0.03 mg/L	
		% Freq.	Mean	Max	Min	% Freq.	Mean
OOAL07GE0001 (3) Wapiti River at Hwy 40 South of Grande Prairie, Alta.	10	60.0	0.0102 ± 0.0021	0.02	0.006	0	-
OOAL11AA0001 North Milk River near the (3) International Boundary, Alta.	11	28.6	0.0085 ± 0.0009	0.011	0.007	0	-
OOAL11AA0003 Milk River near Eastern Crossing (1) of International Boundary, Alta	79	13.9	0.0153 ± 0.0048	0.06	0.006	1.3	0.06

SUMMARY OF SIGNIFICANT SITES - SASKATCHEWAN

SITE IDENTIFICATION	N	Detection Over 0.005 mg/L				Over 0.03 mg/L	
		% Freq.	Mean	Max	Min	% Freq.	Mean
OOSA05EF0001 (3) North Saskatchewan River at Hwy 3 Bridge, Sask.	93	20.4	0.0123 ± 0.0016	0.03	0.006	0	-
00SA05FE0001 (4) Battle River near Unwin, Sask.	119	32.8	0.0115 ± 0.0014	0.054	0.006	0.8	0.054
OOSA05JC0002 (3) Wood River south of Coderre, Sask.	11	36.4	0.0085 ± 0.0009	0.011	0.007	0	-
OOSA05JE0002 (4) Moose Jaw River below Moose Jaw at Hwy 301, Burdick, Sask.	12	83.3	0.0185 ± 0.0028	0.038	0.009	8.3	0.038
OOSA05JF0002 (1) Wascana Creek above Qu'Appelle River, Sask.	9	77.8	0.0383 ± 0.0106	0.092	0.006	44.4	0.0552 ± 0.0123

SUMMARY OF SIGNIFICANT SITES - SASKATCHEWAN

SITE IDENTIFICATION	N	Detection Over 0.005				Over 0.03	
		% Freq.	Mean	Max	Min	% Freq.	Mean
OOSA05JK0002 (3) Qu'Appelle River at Hwy 6 Crossing, Sask.	19	31.6	0.0098 ± 0.0012	0.011	0.006	0	-
OOSA05JM0003 (3) Qu'Appelle River at Hwy 9 Bridge North of Whitewood, Sask.	12	25.0	0.0103 ± 0.0012	0.012	0.008	0	-
OOSA05KH0002 (4) Carrot River near Turnberry, Sask	121	29.8	0.0130 ± 0.0018	0.054	0.006	2.5	0.0137 ± 0.0054
00SA05LC0001 (4) Red Deer River at Erwood, Sask	123	26.0	0.0156 ± 0.0034	0.1	0.006	1.6	0.084 ± 0.0160
OOSA05MD0002 (4) Assiniboine River at Hwy 8 Bridge below Kamsack, Sask.	123	34.1	0.0117 ± 0.0011	0.036	0.006	1.6	0.034 ± 0.0020

SUMMARY OF SIGNIFICANT SITES - SASKATCHEWAN

SITE IDENTIFICATION	N	Detection Over 0.005 mg/L				Over 0.03 mg/L	
		% Freq.	Mean	Max	Min	% Freq.	Mean
OOSA05ND0001 (4) Souris River near Glen Ewen, Sask.	78	35.9	0.0119 ± 0.0025	0.057	0.006	3.8	0.048 ± 0.0067
OOSA11AE0008 (3) East Poplar River at International Boundary, Sask.	42	31.0	0.0098 ± 0.0010	0.18	0.006	0	-
00US05N80001 (4) Long Creek 6km SW of Border Crossing near Noonan, North Dakota, USA	46	43.5	0.0115 ± 0.0025	0.054	0.006	2.1	0.054

SUMMARY OF SIGNIFICANT SITES - MANITOBA

SITE IDENTIFICATION	N	Detection Over 0.005 mg/L				Over 0.03 mg/L	
		% Freq.	Mean	Max	Min	% Freq.	Mean
OOMA05JM0001 (4) Qu-Appelle River at St. Lazare, Man.	14	71.4	0.0491 ± 0.0243	0.25	0.006	21.4	0.136 0.0581
OOMA05KH0001 (2) Saskatchewan River Above Carrot River, Man.	114	17.5	0.0147 ± 0.0027	0.053	0.006	1.8	0.0445 ± 0.0085
OOMA05LD0001 (4) Overflowing River at Hwy 10	69	68.1	0.0166 ± 0.0016	0.05	0.006	7.2	0.0406 ± 0.0034
OOMA05LE0002 (4) Swan River at Hwy 10, Man.	15	53.3	0.0162 ± 0.0031	0.0310	0.007	6.7	0.031
OOMA05LE0003 (3) Woody River at Hwy 10, Man.	15	53.3	0.0130 ± 0.0020	0.02	0.006	0	-
OOMA05LH0001 (3) Waterhen River below Waterhen Man.	12	50.0	0.0107 ± 0.0006	0.012	0.008	0	-

SUMMARY OF SIGNIFICANT SITES - MANITOBA

SITE IDENTIFICATION	N	Detection Over 0.005 mg/L				Over 0.03 mg/L	
		% Freq.	Mean	Max	Min	% Freq.	Mean
OOMA05LJ 0001 (3) Mossy River near outlet of lake	12	50.0	0.0107 ± 0.0018	0.016	0.006	0	-
OOMA05MH0001 (4) Assiniboine River at Brandon, Man	12	58.3	0.0636 ± 0.0419	0.31	0.006	16.7	0.190 ± 0.120
OOMA05MJ0017 (3) Assiniboine River at Bridge on Hwy 100 near Charleswood, Man.	12	75.0	0.0111 ± 0.0021	0.023	0.006	0	-
OOMA05NF0001 (4) Souris River at Coulter, Man.	75	62.7	0.0172 ± 0.0042	0.17	0.006	4.0	0.115 ± 0.0318
00MA05NG0001 (3) Souris River at Wawanesa Dam, Man	12	58.3	0.0169 ± 0.0021	0.029	0.013	0	-
OOMA05NG0013 (4) Pipestone Creek 0.25 mile from Cromer off bridge on Hwy 255, Man	41	16.3	0.0141 ± 0.0031	0.066	0.006	2.44	0.066

SUMMARY OF SIGNIFICANT SITES - MANITOBA

SITE IDENTIFICATION	N	Detection Over 0.005 mg/L				Over 0.03 mg/L	
		% Freq.	Mean	Max	Min	% Freq.	Mean
OOMA05NG0014 (1) Souris River at Treesbank, Man	1	100.0	0.5100	0.51	0.51	100.0	0.51
OOMA050A0003 (3) Badger Creek at Cartwright, Man.	10	70.0	0.0107 ± 0.0015	0.017	0.006	0	-
OOMA050B0001 (4) Pembina River at Windygates, Man.	72	34.7	0.0136 ± 0.0015	0.035	0.006	1.4	0.035
OOMA050C0001 (4) Red River at Emerson, Man.	91	56.0	0.0116 ± 0.0018	0.068	0.006	4.4	0.051 ± 0.0074
OOMA05OD0001 (4) Roseau River at Gardenton, Man.	82	61.0	0.0125 ± 0.0028	0.14	0.006	3.7	0.0767 ± 0.0322
OOMA05OD0007 (3) Sprague Creek near Sprague, Man	10	50.0	0.0132 ± 0.0033	0.024	0.006	0	-
OOMA050D0012 (3) Pine Creek Diversion at Hwy 89, Man.	13	30.8	0.0085 ± 0.0010	0.011	0.007	0	-

SUMMARY OF SIGNIFICANT SITES - MANITOBA

SITE IDENTIFICATION	N	Detection Over 0.005 mg/L				Over 0.03 mg/L	
		% Freq.	Mean	Max	Min	% Freq.	Mean
OOMA050J0001 (3) Red River at Selkirk, Man	11	63.6	0.0151 ± 0.0021	0.025	0.009	0	-
OOMA05PF0022 (4) Winnipeg River at Pointe Du Bois, Man.	76	25.0	0.0152 ± 0.0035	0.057	0.006	3.9	0.047 ± 0.0076
OOMA05RA0004 (3) Manigotagan River at Hwy 304 Bridge, Manigotagan, Man.	13	46.2	0.0118 ± 0.0020	0.018	0.006	0	-
OOMA05SH001 (3) Saskatchewan River below Grand Rapids Power Plant Near Grand Rapids, Man.	12	41.7	0.0096 ± 0.0019	0.017	0.006	0	-

SUMMARY OF SIGNIFICANT SITES - NORTHWEST TERRITORIES

SITE IDENTIFICATION	N	Detection Over 0.005 mg/L				Over 0.03 mg/L	
		% Freq.	Mean	Max	Min	% Freq.	Mean
OONW07SB0003 (4) Yellowknife Bay at culvert near Giant Rec Hall, Giant Yellowknife Mines, NWT	18	88.9	0.8057 ± 0.2421	3.0	0.013	77.8	0.9185 ± 0.264
OONW07SB0008 (1) Baker Creek, approx. 1000 ft. above mill at Water Survey Station, Giant Yellowknife Mine, NWT	6	33.3	0.3300 ± 0.0270	0.06	0.006	16.7	0.06
OONW 10EA0001 (4) Flat River above mine raw water intake Canada Tungsten Mine, NWT	11	18.1	0.0650 ± 0.0150	0.08	0.05	18.2	0.065 ± 0.015
OONW10EA0002 (1) Flat River at causeway culvert below mill decant discharge, the west of the large culvert, Canada Tungsten Mine, NWT	9	55.6	0.2002 ± 0.1067	0.59	0.01	33.3	0.323 ± 0.138

SUMMARY OF SIGNIFICANT SITES - NORTHWEST TERRITORIES

SITE IDENTIFICATION	N	Detection Over 0.005 mg/L				Over 0.03 mg/L	
		% Freq.	Mean	Max	Min	% Freq.	Mean
OONW10EA0003 (1) Sardine Creek at culvert at road to Watson Lake, Canada Tungsten Mine Site 3, NWT	4	50.0	0.1050 ± 0.0150	0.12	0.09	50.0	0.105 ± 0.015
OONW10EA0005 (4) Flat River approx. 1 mile downstream of tailings decant discharge Canada Tungsten Mines, NWT	10	100.0	0.0788 ± 0.0115	0.13	0.012	90.0	0.0862 ± 0.0098
01NW07SB0003 (4) Yellowknife Bay, Great Slave Lk at freshwater intake for mill discharge to Yellowknife Bay Giant Yellowknife Mine, NWT	13	38.5	0.0746 ± 0.0355	0.18	0.012	15.4	0.02 ± 0.0200
10NW07PB0002 (1) Discharge at Pit K57 ditch at Access Road Cominco Pine Point Mines, NWT	7	28.6	0.0290 ± 0.0210	0.05	0.008	14.3	0.05
22NW07PB0004 (4) Filtered combined circuits tailings at discharge to tailings area, Cominco Pine Point Mines, NWT	36	100.0	2.9887 ± 0.3610	10.7	0.015	97.2	3.0737 ± 0.361

SUMMARY OF SIGNIFICANT SITES - NORTHWEST TERRITORIES

SITE IDENTIFICATION	N	Detection Over 0.005 mg/L				Over 0.03 mg/L	
		% Freq.	Mean	Max	Min	% Freq.	Mean
22NW07PB0005 (4) Tailings Decant overflow structure in tailings area, Cominco Pine Point Mine, NWT	31	100.0	3.0220 ± 0.1350	9.8	0.009	93.5	3.2289 ± 0.439
22NW07SB0009 (4) Tailings discharge to tailings area #1 at end of tailings pipe, 1800 ft. from the mill, Giant Yellowknife Mines, NWT	12	100.0	25.9700 ± 6.6700	78.	0.031	100.0	25.97 ± 6.67
22NW07SB0010 (1) Tailings decant at tailings area #1 outlet structure, (at point of discharge to tailings Area #2 through manmade concrete decant mechanism) Giant Yellowknife Mines, NWT	4	100.0	17.0800 ± 5.0400	26.5	2.8	100.0	17.08 ± 5.04
22NW07SB0011 (1) Tailings decant at Area #2 outlet structure to Baker Creek (discharge pipe on downstream side of dyke) Approx. 900 ft. from Prosperous Lake road, Giant Yellowknife Mine	6	100.0	19.8700 ± 4.8600	36.0	0.026	83.3	23.84 ± 3.43

SUMMARY OF SIGNIFICANT SITES - NORTHWEST TERRITORIES

SITE IDENTIFICATION	N	Detection Over 0.005 mg/L				Over 0.03 mg/L	
		% Freq.	Mean	Max	Min	% Freq.	Mean
22NW07SB0012 (4) Discharge from mine shaft "C" to Baker Creek at West side of Prosperous Lake road, (discharge pipe is 600 feet from mill) Giant Yellowknife Mines, NWT	15	93.3	0.9740 ± 0.2750	3.5	0.011	86.7	1.048 ± 0.286
22NW07SB0013 (4) Discharge from mine shaft "A" to Baker Creek culvert discharge pipe, (near east side of mill road) Giant Yellowknife Mines, NWT	15	60.0	0.2900 ± 0.0961	0.9	0.028	46.7	0.365 ± 0.108
22NW07SB0014 (1) Tailings seepage from West Area #1 to Yellowknife Bay, Great Slave Lake, Giant Yellowknife Mine, NWT	7	100.0	21.3800 ± 8.0600	58.0	0.016	85.7	24.95 ± 8.56
22NW07SB0016 (1) Discharge from compressor cooling to Baker Creek, Approx. 600 ft southwest of reservoir spillway, Giant Yellowknife Mines NWT	2	100.0	0.0700 ± 0.0200	0.09	0.05	100.0	0.07 ± 0.02

SUMMARY OF SIGNIFICANT SITES - NORTHWEST TERRITORIES

SITE IDENTIFICATION	N	Detection Over 0.005 mg/L				Over 0.03 mg/L	
		% Freq.	Mean	Max	Min	% Freq.	Mean
22NW07SB0018 (4) Tailings to discharge to Pud Lake Cominco Yellowknife Mines, NWT	10	100.0	16.9100 ± 9.4000	79.0	0.027	90.	18.79 ± 10.30
22NW07SB0019 (1) Decant Creek to Cam Lake, approx. 20 feet below Pud Lake dyke, Cominco Yellowknife Mines, NWT	9	88.9	2.4650 ± 1.1600	8.9	0.044	88.9	2.465 ± 1.16
22 NW07SB0020 (4) Decant Creek at northern end leading from Pud Lake to Meg Lake Cominco Yellowknife Mine, NWT	12	100.0	3.7830 ± 1.2200	11.	0.038	100.0	3.783 ± 1.22
22NW07SB0021 (1) Keg Lake at centre, Cominco Yellowknife Mines, NWT	1	100.0	0.1200	0.12	0.12	100.0	0.12
22NW10EA0003 (1) Flat River downstream of Sardine Creek 15 to 20 feet downstream of Confluence, Canada Tungsten Mines NWT	7	14.3	0.0700	0.07	0.07	14.3	0.07

SUMMARY OF SIGNIFICANT SITES - NORTHWEST TERRITORIES

SITE IDENTIFICATION	N	Detection Over 0.005 mg/L				Over 0.03 mg/L	
		% Freq.	Mean	Max	Min	% Freq.	Mean
22NW10EA0004 (1) Wastewater discharge from mill decant to Flat River, Canada Tungsten Mine, NWT	6	100.0	0.9750 ± 0.3640	2.4	0.029	83.3	1.164 ± 0.381
22NW10EA0005 (4) Tailings discharge from mill into tailings area, Canada Tungsten Mines, N.W.T.	10	100.0	15.0300 ± 3.2190	39.	0.05	100.	15.03 ± 3.219
22NW10EA0006 (1) Mill tailings decant into Flat River Canada Tungsten Mines, NWT	6	100.0	8.3503 ± 5.9823	36.	0.009	50.0	16.69 ± 10.46
22NW10JA0003 (1) Echo Bay Mine Station 1, Mine Water effluent from #3 Adit, NWT	1	100.0	0.0500	0.05	0.05	100.0	0.05

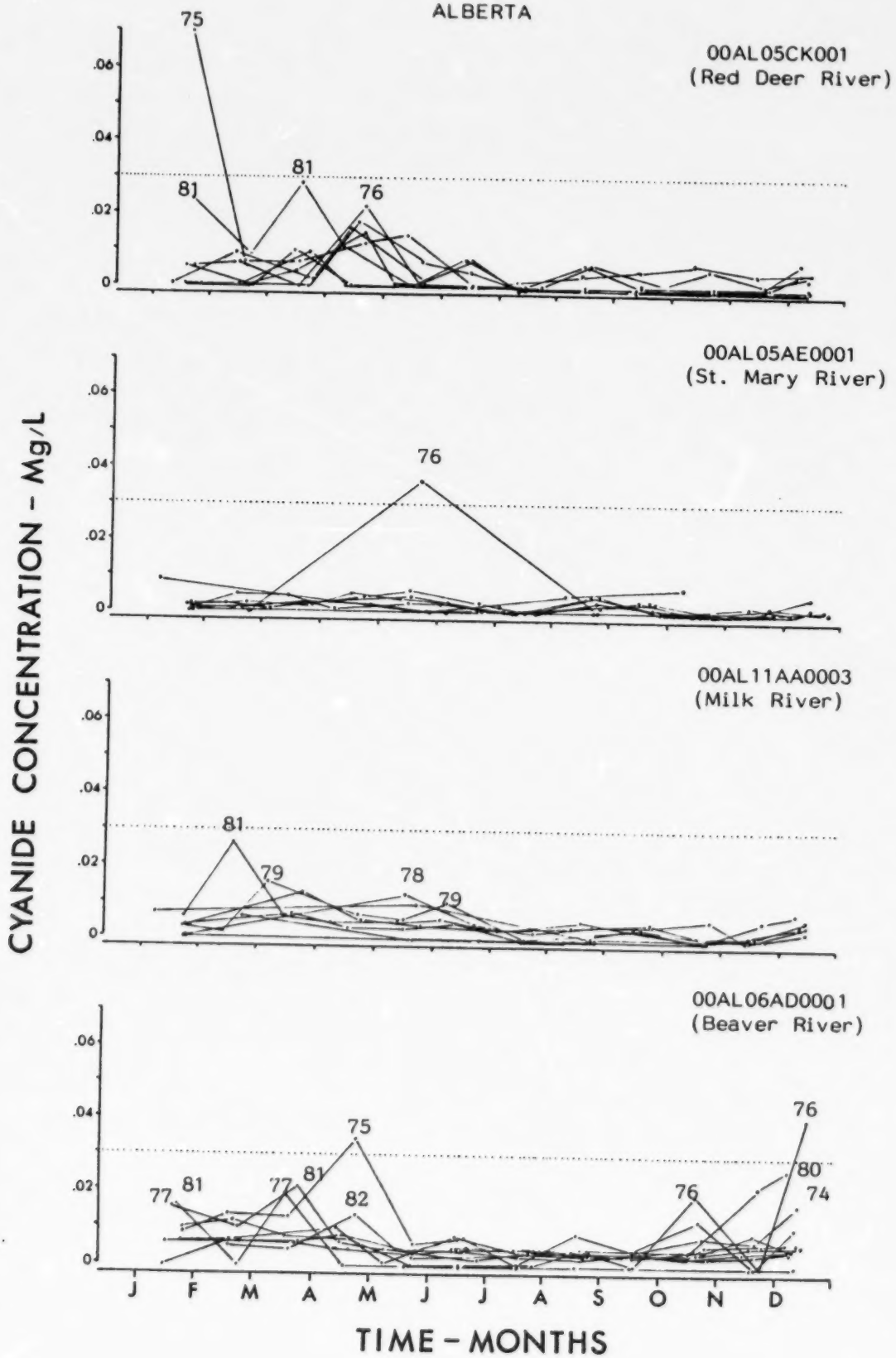
FIGURES OF SIGNIFICANT SITES

Data were plotted for selected sites chosen as detailed in Section 5.3

The solid lines have been included to identify measurements from the same year. These lines are not intended to imply scale continuity between connected points.

In some graphs (where high values were reported), the year was identified.

ALBERTA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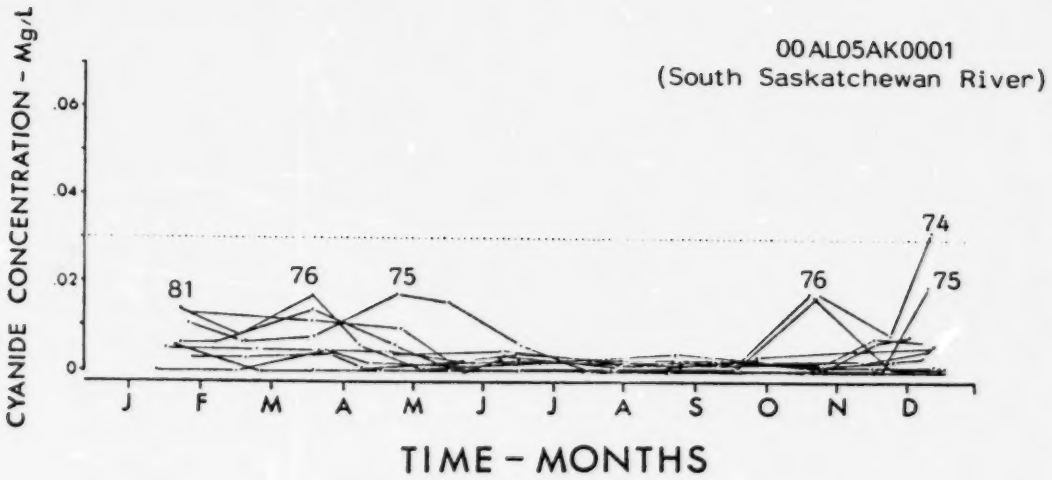
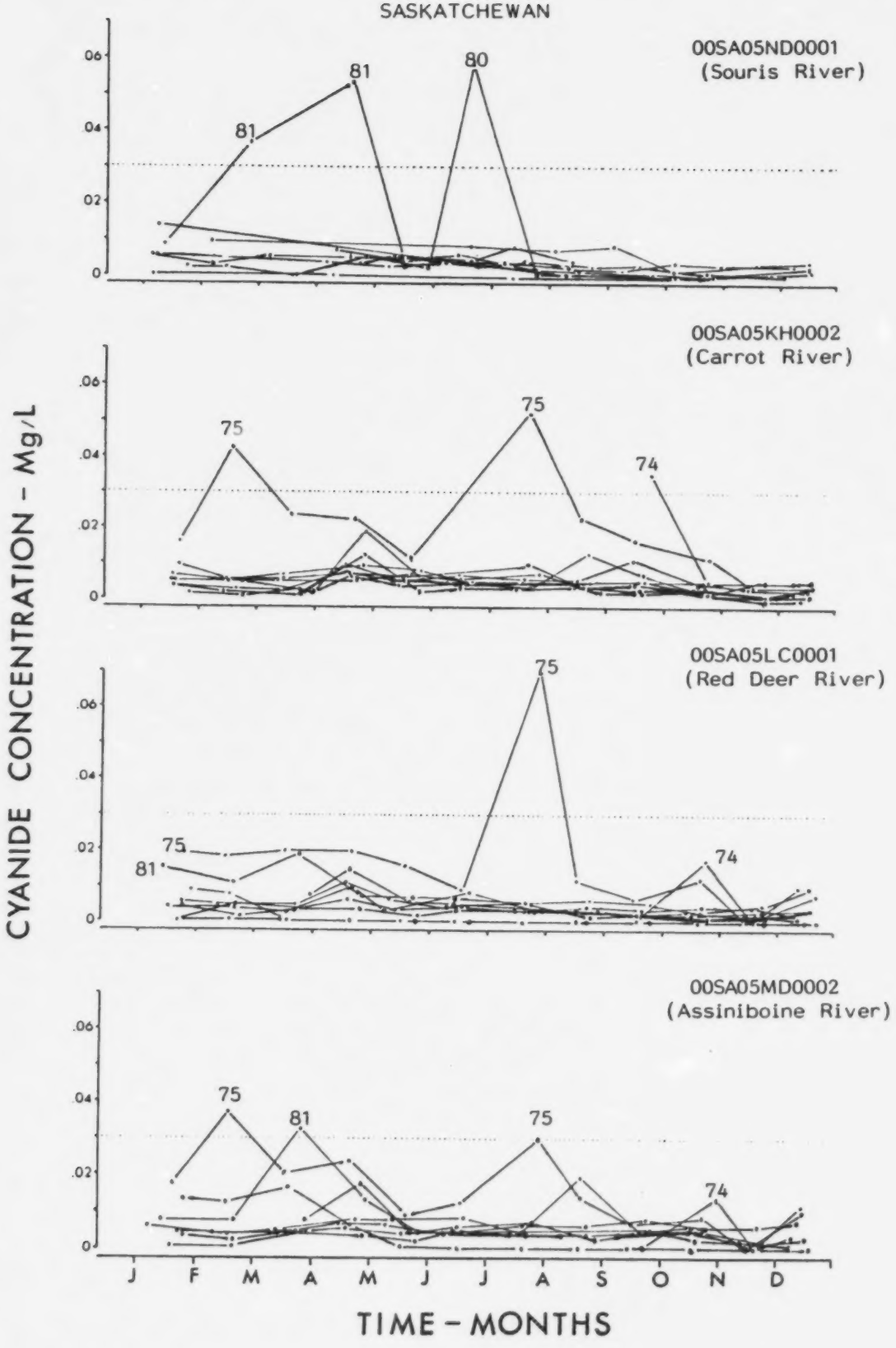
(Red Deer River)
00AL05AE0001
(St. Mary River)
00AL11AA0003
(Milk River)
00AL06AD0001
(Beaver River)
CYANIDE CONCENTRATION - Mg/L
.06
.04
.02
0
75
81
81
76
76
81
79
78
79
77
81
77
81
75
82
76
80
74
J F M A M J J A S O N D
TIME - MONTHS

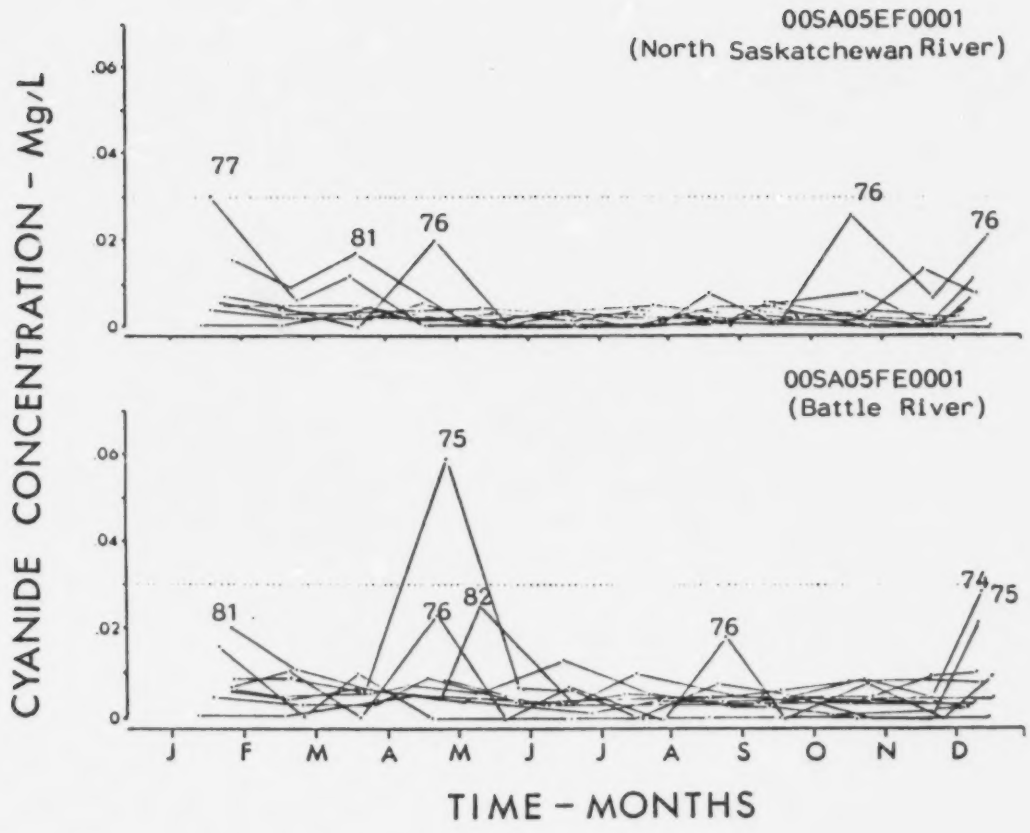
ALBERTA (Continued)



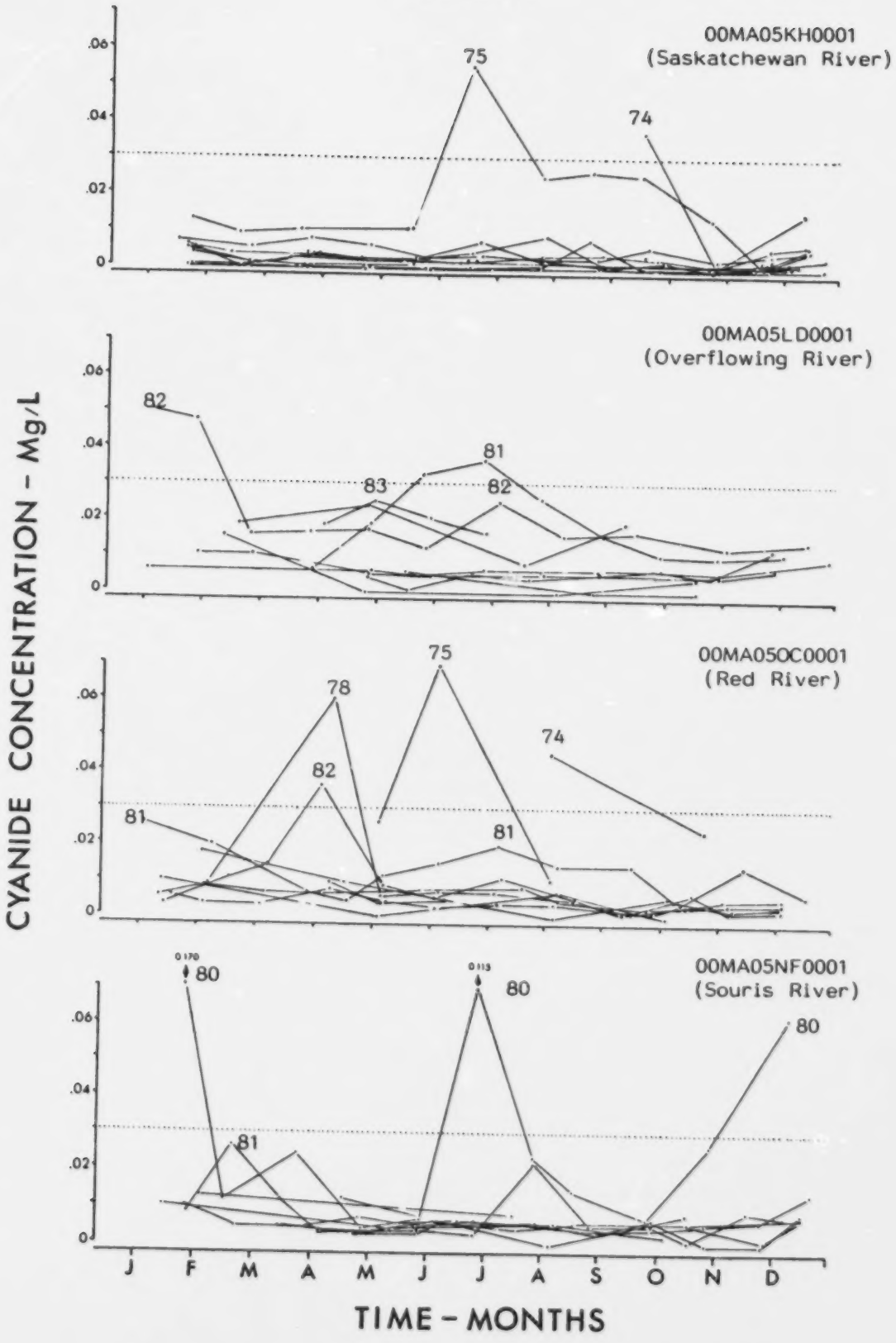
SASKATCHEWAN



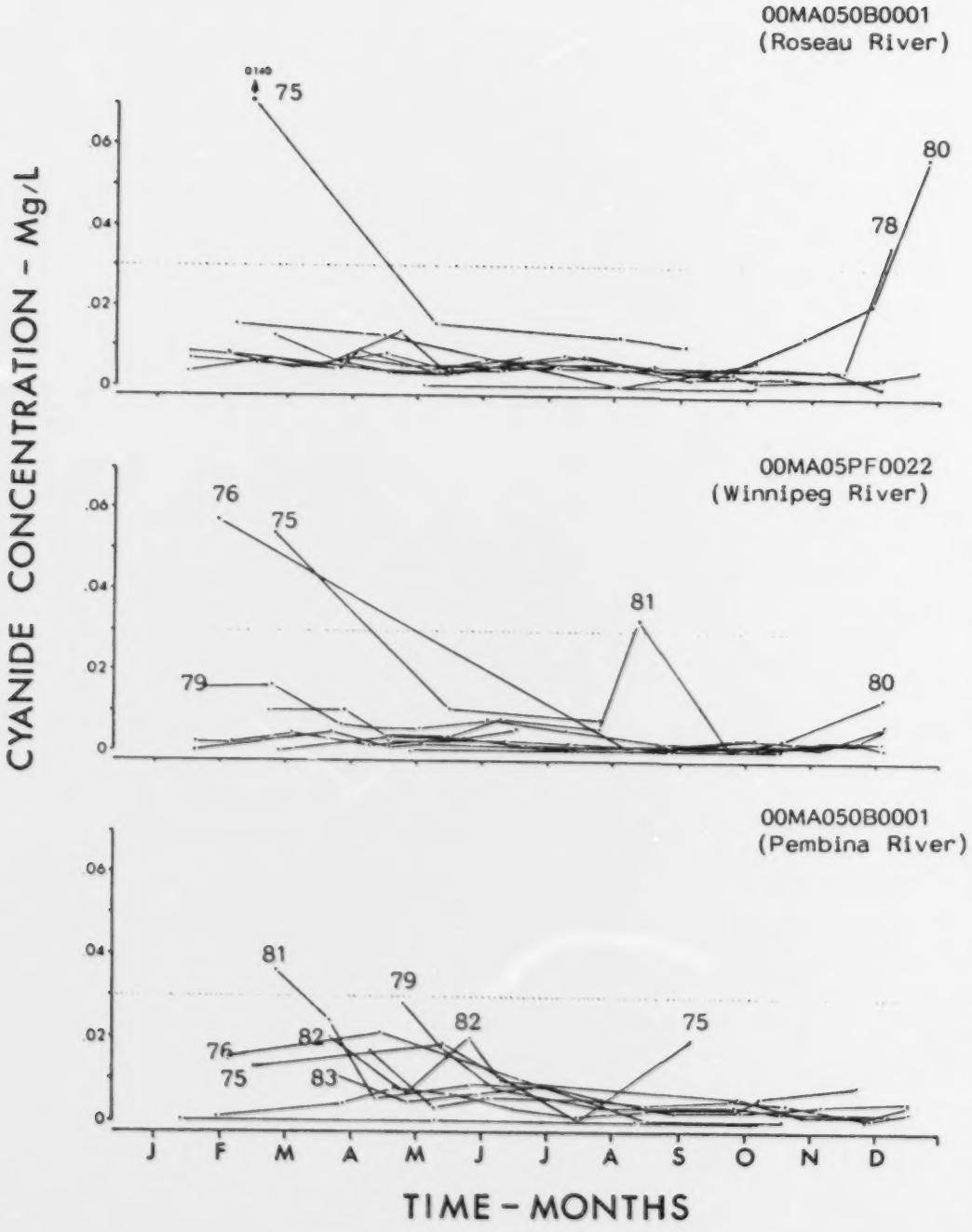
SASKATCHEWAN (Continued)

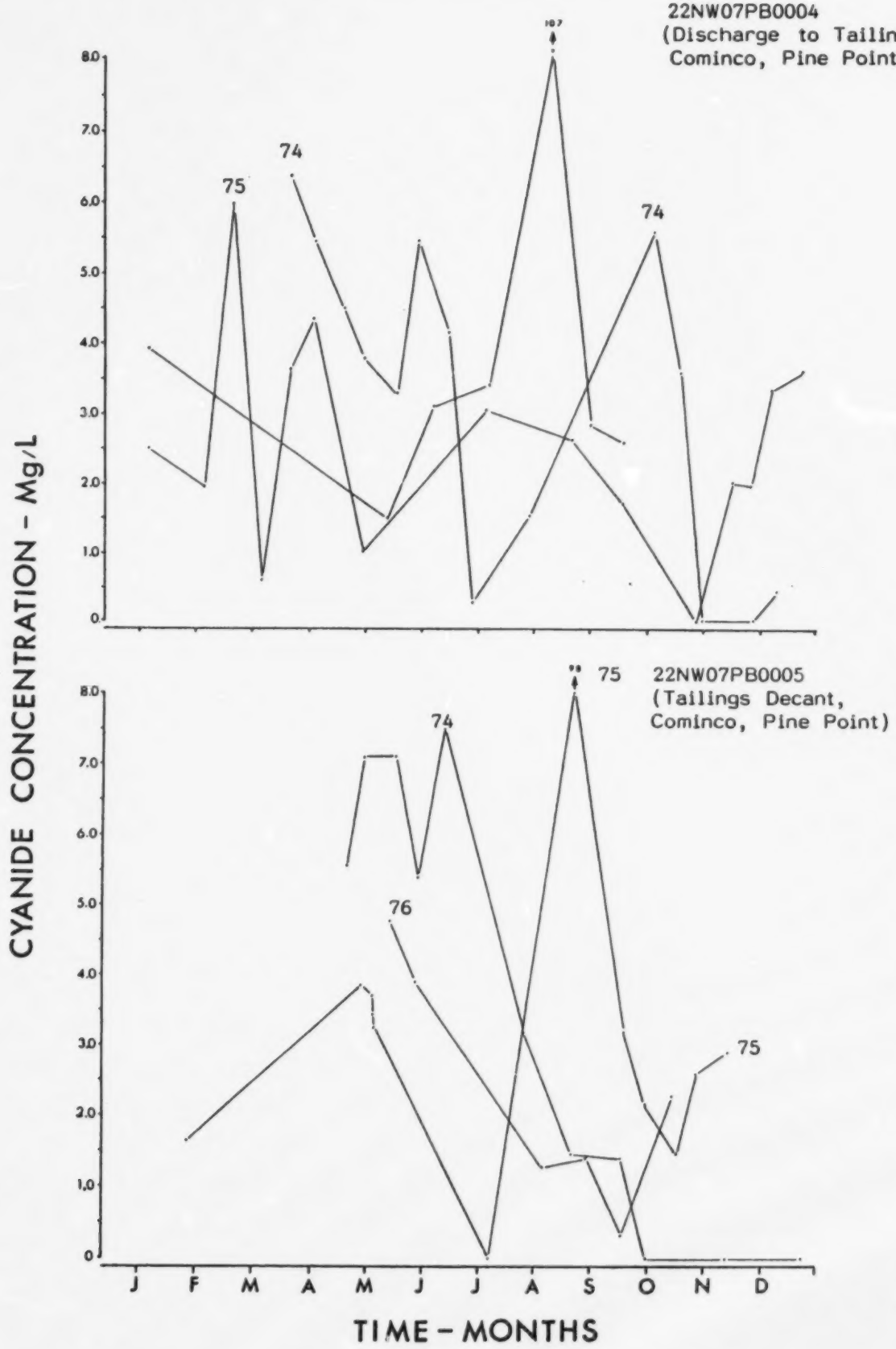


78
MANITOBA


00MA05KH0001
(Saskatchewan River)
75
74
00MA05LD0001
(Overflowing River)
82
81
83
82
00MA05OC0001
(Red River)
75
78
74
82
81
81
00MA05NF0001
(Souris River)
0.170
80
0.113
80
80
81
.06
.04
.02
0
CYANIDE CONCENTRATION - Mg/L
J F M A M J J A S O N D
TIME - MONTHS

MANITOBA (Continued)




22NW07PB0004
(Discharge to Tailings
Cominco, Pine Point)
187
74
75
74
8.0
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0
22NW07PB0005
(Tailings Decant,
Cominco, Pine Point)
75
74
76
75
1.0
J F M A M J J A S O N D
CYANIDE CONCENTRATION - Mg/L
TIME - MONTHS

TOTAL CYANIDE DATA BASE - SUMMARY STATISTICS 14:56 WEDNESDAY, APRIL 9, 1986

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE
STATION=00AL05AA0001						
CN	TOTAL CYANIDE IN MG/L	9	0.0017	0.0012	0.0100	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0100	.	0.0100	0.0100
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL05AA0002						
CN	TOTAL CYANIDE IN MG/L	9	0.0012	0.0008	0.0060	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0060	.	0.0060	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL05AA0003						
CN	TOTAL CYANIDE IN MG/L	9	0.0014	0.0010	0.0070	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	2	0.0065	0.0005	0.0070	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL05AA0004						
CN	TOTAL CYANIDE IN MG/L	9	0	0	0	0
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL05AA0005						
CN	TOTAL CYANIDE IN MG/L	11	0.0035	0.0015	0.0120	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	4	0.0097	0.0009	0.0120	0.0080
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL05AC0009						
CN	TOTAL CYANIDE IN MG/L	6	0.0018	0.0018	0.0110	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0110	.	0.0110	0.0110
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL05AD0005						
CN	TOTAL CYANIDE IN MG/L	75	0.0016	0.0002	0.0090	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	3	0.0080	0.0006	0.0090	0.0070
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL05AD0060						
CN	TOTAL CYANIDE IN MG/L	7	0.0021	0.0013	0.0090	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0090	.	0.0090	0.0090
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL05AE0001						
CN	TOTAL CYANIDE IN MG/L	82	0.0020	0.0005	0.0360	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	5	0.0132	0.0057	0.0360	0.0060

GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	1	0.0360	.	0.0360	0.0360

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE
STATION=00AL05AE0026						
CN	TOTAL CYANIDE IN MG/L	12	0	0	0	0
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL05AG0001						
CN	TOTAL CYANIDE IN MG/L	10	0.0075	0.0057	0.0580	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	3	0.0233	0.0173	0.0580	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	1	0.0580	.	0.0580	0.0580
STATION=00AL05AK0001						
CN	TOTAL CYANIDE IN MG/L	118	0.0038	0.0004	0.0310	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	21	0.0119	0.0013	0.0310	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	1	0.0310	.	0.0310	0.0310
STATION=00AL05BA0011						
CN	TOTAL CYANIDE IN MG/L	8	0.0054	0.0026	0.0210	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	3	0.0127	0.0044	0.0210	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL05BD0002						
CN	TOTAL CYANIDE IN MG/L	6	0.0027	0.0018	0.0100	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	2	0.0080	0.0020	0.0100	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL05BE0013						
CN	TOTAL CYANIDE IN MG/L	70	0.0015	0.0003	0.0130	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	3	0.0110	0.0012	0.0130	0.0090
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL05BJ0003						
CN	TOTAL CYANIDE IN MG/L	10	0.0037	0.0021	0.0170	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	3	0.0123	0.0033	0.0170	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL05BL0001						
CN	TOTAL CYANIDE IN MG/L	10	0.0008	0.0008	0.0080	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0080	.	0.0080	0.0080
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL05BN0001						
CN	TOTAL CYANIDE IN MG/L	9	0.0033	0.0014	0.0090	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	3	0.0083	0.0007	0.0090	0.0070
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE
STATION=00AL05CA0001						
CN	TOTAL CYANIDE IN MG/L	11	0.0007	0.0007	0.0080	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0080	.	0.0080	0.0080
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL05CE0001						
CN	TOTAL CYANIDE IN MG/L	9	0.0019	0.0009	0.0060	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	2	0.0060	0.0000	0.0060	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL05CK0001						
CN	TOTAL CYANIDE IN MG/L	120	0.0047	0.0008	0.0700	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	23	0.0162	0.0035	0.0700	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	2	0.0655	0.0045	0.0700	0.0610
STATION=00AL05DA0001						
CN	TOTAL CYANIDE IN MG/L	2	0.0065	0.0065	0.0130	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0130	.	0.0130	0.0130
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL05DA0002						
CN	TOTAL CYANIDE IN MG/L	6	0.0012	0.0012	0.0070	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0070	.	0.0070	0.0070
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL05DB0006						
CN	TOTAL CYANIDE IN MG/L	9	0.0011	0.0011	0.0100	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0100	.	0.0100	0.0100
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL05DC0001						
CN	TOTAL CYANIDE IN MG/L	8	0.0035	0.0017	0.0100	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	3	0.0093	0.0007	0.0100	0.0080
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL05EC0004						
CN	TOTAL CYANIDE IN MG/L	9	0.0038	0.0018	0.0150	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	2	0.0120	0.0030	0.0150	0.0090
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL05EF0001						
CN	TOTAL CYANIDE IN MG/L	25	0.0032	0.0003	0.0090	0.0010
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0090	.	0.0090	0.0090
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

VARIABLE	LABEL	N	MEAN	STD ERROR	MAXIMUM	MINIMUM

			OF MEAN	VALUE	VALUE
STATION=00AL06AD0001					
CN	TOTAL CYANIDE IN MG/L	118	0.0057	0.0006	0.0430	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	34	0.0126	0.0014	0.0430	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	2	0.0380	0.0050	0.0430	0.0330
STATION=00AL07AA0007						
CN	TOTAL CYANIDE IN MG/L	6	0.0018	0.0012	0.0060	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0060	.	0.0060	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL07AA0015						
CN	TOTAL CYANIDE IN MG/L	7	0.0027	0.0016	0.0110	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0110	.	0.0110	0.0110
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL07AA0023						
CN	TOTAL CYANIDE IN MG/L	76	0.0017	0.0003	0.0190	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	5	0.0106	0.0023	0.0190	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL07BB0003						
CN	TOTAL CYANIDE IN MG/L	9	0.0071	0.0043	0.0400	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	3	0.0197	0.0102	0.0400	0.0090
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	1	0.0400	.	0.0400	0.0400
STATION=00AL07BC0001						
CN	TOTAL CYANIDE IN MG/L	9	0.0026	0.0014	0.0110	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	2	0.0090	0.0020	0.0110	0.0070
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL07BE0001						
CN	TOTAL CYANIDE IN MG/L	10	0.0038	0.0014	0.0120	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	3	0.0093	0.0015	0.0120	0.0070
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL07CD0001						
CN	TOTAL CYANIDE IN MG/L	11	0.0039	0.0016	0.0140	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	3	0.0110	0.0021	0.0140	0.0070
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00AL07DA0001						
CN	TOTAL CYANIDE IN MG/L	11	0.0031	0.0011	0.0090	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	4	0.0072	0.0008	0.0090	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

TOTAL CYANIDE DATA BASE - SUMMARY STATISTICS 14:56 WEDNESDAY, APRIL 9, 1986

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00AL07DA0003

CN	TOTAL CYANIDE IN MG/L	13	0.0058	0.0026	0.0340	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	5	0.0142	0.0050	0.0340	0.0080
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	1	0.0340	.	0.0340	0.0340

STATION=00AL07GA0002

CN	TOTAL CYANIDE IN MG/L	2	0	0	0	0
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00AL07GE0001

CN	TOTAL CYANIDE IN MG/L	10	0.0061	0.0021	0.0200	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	6	0.0102	0.0021	0.0200	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00AL07GJ0001

CN	TOTAL CYANIDE IN MG/L	9	0.0060	0.0030	0.0220	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	3	0.0163	0.0047	0.0220	0.0070
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00AL11AA0001

CN	TOTAL CYANIDE IN MG/L	14	0.0029	0.0011	0.0110	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	4	0.0085	0.0009	0.0110	0.0070
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00AL11AA0002

CN	TOTAL CYANIDE IN MG/L	14	0.0019	0.0007	0.0080	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0080	.	0.0080	0.0080
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00AL11AA0003

CN	TOTAL CYANIDE IN MG/L	79	0.0039	0.0008	0.0600	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	11	0.0153	0.0048	0.0600	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	1	0.0600	.	0.0600	0.0600

STATION=00AL11AA0014

CN	TOTAL CYANIDE IN MG/L	2	0	0	0	0
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00MA05JM0001

CN	TOTAL CYANIDE IN MG/L	14	0.0354	0.0181	0.2500	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	10	0.0491	0.0243	0.2500	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	3	0.1363	0.0581	0.2500	0.0590

TOTAL CYANIDE DATA BASE - SUMMARY STATISTICS 14:56 WEDNESDAY, APRIL 9, 1986

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00MA05KH0001

CN	TOTAL CYANIDE IN MG/L	114	0.0041	0.0007	0.0530	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	20	0.0147	0.0027	0.0530	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	2	0.0445	0.0085	0.0530	0.0360

STATION=00MA05LD0001

CN	TOTAL CYANIDE IN MG/L	69	0.0125	0.0013	0.0500	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	47	0.0166	0.0016	0.0500	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	5	0.0406	0.0034	0.0500	0.0320

STATION=00MA05LE0002

CN	TOTAL CYANIDE IN MG/L	15	0.0094	0.0026	0.0310	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	8	0.0162	0.0031	0.0310	0.0070
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	1	0.0310	.	0.0310	0.0310

STATION=00MA05LE0003

CN	TOTAL CYANIDE IN MG/L	15	0.0074	0.0019	0.0200	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	8	0.0130	0.0020	0.0200	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00MA05LH0001

CN	TOTAL CYANIDE IN MG/L	12	0.0053	0.0016	0.0120	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	6	0.0107	0.0006	0.0120	0.0080
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00MA05LJ0001

CN	TOTAL CYANIDE IN MG/L	12	0.0053	0.0018	0.0160	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	6	0.0107	0.0018	0.0160	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00MA05LM0004

CN	TOTAL CYANIDE IN MG/L	9	0.0050	0.0022	0.0160	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	4	0.0112	0.0022	0.0160	0.0070
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00MA05MH0001

CN	TOTAL CYANIDE IN MG/L	12	0.0371	0.0255	0.3100	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	7	0.0636	0.0419	0.3100	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	2	0.1900	0.1200	0.3100	0.0700

STATION=00MA05MH0003

CN	TOTAL CYANIDE IN MG/L	1	0.0170	.	0.0170	0.0170
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0170	.	0.0170	0.0170
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00MA05MJ0017

CN	TOTAL CYANIDE IN MG/L	12	0.0110	0.0023	0.0230	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	9	0.0141	0.0021	0.0230	0.0060

GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00MA05MJ0035

CN	TOTAL CYANIDE IN MG/L	1	0.0150	.	0.0150	0.0150
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0150	.	0.0150	0.0150
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00MA05NF0001

CN	TOTAL CYANIDE IN MG/L	75	0.0123	0.0027	0.1700	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	47	0.0172	0.0042	0.1700	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	3	0.1150	0.0318	0.1700	0.0600

STATION=00MA05NF0005

CN	TOTAL CYANIDE IN MG/L	6	0.0068	0.0020	0.0130	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	3	0.0103	0.0022	0.0130	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00MA05NF0009

CN	TOTAL CYANIDE IN MG/L	7	0.0059	0.0021	0.0150	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	3	0.0107	0.0026	0.0150	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00MA05NG0001

CN	TOTAL CYANIDE IN MG/L	12	0.0107	0.0026	0.0290	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	7	0.0169	0.0021	0.0290	0.0130
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00MA05NG0004

CN	TOTAL CYANIDE IN MG/L	1	0.0090	.	0.0090	0.0090
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0090	.	0.0090	0.0090
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00MA05NG0013

CN	TOTAL CYANIDE IN MG/L	41	0.0084	0.0016	0.0660	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	19	0.0141	0.0031	0.0660	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	1	0.0660	.	0.0660	0.0660

STATION=00MA05NG0014

CN	TOTAL CYANIDE IN MG/L	1	0.5100	.	0.5100	0.5100
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.5100	.	0.5100	0.5100
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	1	0.5100	.	0.5100	0.5100

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00MA05NG0018

CN	TOTAL CYANIDE IN MG/L	1	0	.	0	0
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00MA05DA0003

CN	TOTAL CYANIDE IN MG/L	10	0.0079	0.0018	0.0170	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	7	0.0107	0.0015	0.0170	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00MA05DB0001

CN	TOTAL CYANIDE IN MG/L	72	0.0067	0.0008	0.0350	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	25	0.0136	0.0015	0.0350	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	1	0.0350	.	0.0350	0.0350

STATION=00MA05DB0011

CN	TOTAL CYANIDE IN MG/L	4	0.0100	0.0039	0.0180	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	3	0.0133	0.0029	0.0180	0.0080
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00MA05DB0014

CN	TOTAL CYANIDE IN MG/L	4	0.0105	0.0044	0.0200	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	3	0.0140	0.0038	0.0200	0.0070
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00MA05DC0001

CN	TOTAL CYANIDE IN MG/L	91	0.0097	0.0011	0.0680	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	51	0.0146	0.0018	0.0680	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	4	0.0510	0.0074	0.0680	0.0350

STATION=00MA05DD0001

CN	TOTAL CYANIDE IN MG/L	82	0.0090	0.0018	0.1400	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	50	0.0125	0.0028	0.1400	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	3	0.0767	0.0322	0.1400	0.0350

STATION=00MA05DD0007

CN	TOTAL CYANIDE IN MG/L	10	0.0066	0.0027	0.0240	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	5	0.0132	0.0033	0.0240	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00MA05DD0012

CN	TOTAL CYANIDE IN MG/L	13	0.0032	0.0011	0.0110	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	4	0.0085	0.0010	0.0110	0.0070
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

TOTAL CYANIDE DATA BASE - SUMMARY STATISTICS 14:56 WEDNESDAY, APRIL 9, 1986

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00MA05DJ0001

CN	TOTAL CYANIDE IN MG/L	11	0.0105	0.0024	0.0250	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	7	0.0151	0.0021	0.0250	0.0090
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00MA05PF0022

CN	TOTAL CYANIDE IN MG/L	76	0.0058	0.0011	0.0570	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	19	0.0152	0.0035	0.0570	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	3	0.0470	0.0076	0.0570	0.0320

STATION=00MA05RA0004

CN	TOTAL CYANIDE IN MG/L	13	0.0069	0.0017	0.0180	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	6	0.0118	0.0020	0.0180	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00MA05SH0001

CN	TOTAL CYANIDE IN MG/L	12	0.0044	0.0016	0.0170	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	5	0.0096	0.0019	0.0170	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00NW07PB0004

CN	TOTAL CYANIDE IN MG/L	4	0.0060	0.0036	0.0140	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	2	0.0120	0.0020	0.0140	0.0100
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00NW07SB0003

CN	TOTAL CYANIDE IN MG/L	18	0.7165	0.2230	3.0000	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	16	0.8057	0.2421	3.0000	0.0130
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	14	0.9185	0.2635	3.0000	0.0490

STATION=00NW07SB0005

CN	TOTAL CYANIDE IN MG/L	3	0.0050	0.0025	0.0080	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	2	0.0075	0.0005	0.0080	0.0070
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00NW07SB0006

CN	TOTAL CYANIDE IN MG/L	1	0	.	0	0
GT_5PPB	CYANIDE VALUES GRAATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00NW07SB0008

CN	TOTAL CYANIDE IN MG/L	6	0.0110	0.0098	0.0600	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	2	0.0330	0.0270	0.0600	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	1	0.0600	.	0.0600	0.0600

TOTAL CYANIDE DATA BASE - SUMMARY STATISTICS 14:56 WEDNESDAY, APRIL 9, 1986

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00NW10EA0001

CN	TOTAL CYANIDE IN MG/L	11	0.0118	0.0082	0.0800	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	2	0.0650	0.0150	0.0800	0.0500
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	2	0.0650	0.0150	0.0800	0.0500

STATION=00NW10EA0002

CN	TOTAL CYANIDE IN MG/L	9	0.1112	0.0663	0.5900	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	5	0.2002	0.1067	0.5900	0.0100

GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	3	0.3233	0.1378	0.5900	0.1300

STATION=00NW10EA0003

CN	TOTAL CYANIDE IN MG/L	4	0.0537	0.0302	0.1200	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	2	0.1050	0.0150	0.1200	0.0900
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	2	0.1050	0.0150	0.1200	0.0900

STATION=00NW10EA0005

CN	TOTAL CYANIDE IN MG/L	10	0.0788	0.0115	0.1300	0.0120
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	10	0.0788	0.0115	0.1300	0.0120
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	9	0.0862	0.0098	0.1300	0.0400

STATION=00NW10JA0002

CN	TOTAL CYANIDE IN MG/L	2	0	0	0	0
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00NW10JA0005

CN	TOTAL CYANIDE IN MG/L	1	0.0050	.	0.0050	0.0050
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00SA05EF0001

CN	TOTAL CYANIDE IN MG/L	93	0.0041	0.0006	0.0300	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	19	0.0123	0.0016	0.0300	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00SA05FE0001

CN	TOTAL CYANIDE IN MG/L	119	0.0056	0.0006	0.0540	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	39	0.0115	0.0014	0.0540	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	1	0.0540	.	0.0540	0.0540

STATION=00SA05GC0001

CN	TOTAL CYANIDE IN MG/L	12	0.0021	0.0016	0.0180	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	2	0.0125	0.0055	0.0180	0.0070
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00SA05660001

CN	TOTAL CYANIDE IN MG/L	12	0.0015	0.0010	0.0100	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	2	0.0090	0.0010	0.0100	0.0080
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00SA05660003

CN	TOTAL CYANIDE IN MG/L	11	0.0027	0.0004	0.0060	0.0010
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0060	.	0.0060	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00SA05HD0004

CN	TOTAL CYANIDE IN MG/L	11	0.0015	0.0010	0.0080	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	2	0.0080	0.0000	0.0080	0.0080
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00SA05HH0002

CN	TOTAL CYANIDE IN MG/L	12	0.0015	0.0010	0.0100	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	2	0.0090	0.0010	0.0100	0.0080
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00SA05HH0004

CN	TOTAL CYANIDE IN MG/L	1	0.0020	.	0.0020	0.0020
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00SA05HH0007

CN	TOTAL CYANIDE IN MG/L	8	0.0021	0.0004	0.0040	0.0010
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00SA05JC0002

CN	TOTAL CYANIDE IN MG/L	11	0.0031	0.0013	0.0110	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	4	0.0085	0.0009	0.0110	0.0070
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00SA05JE0002

CN	TOTAL CYANIDE IN MG/L	12	0.0154	0.0031	0.0380	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	10	0.0185	0.0028	0.0380	0.0090
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	1	0.0380	.	0.0380	0.0380

STATION=00SA05JF0002

CN	TOTAL CYANIDE IN MG/L	9	0.0303	0.0097	0.0920	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	7	0.0383	0.0106	0.0920	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	4	0.0552	0.0123	0.0920	0.0420

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00SA05JK0002

CN	TOTAL CYANIDE IN MG/L	19	0.0042	0.0010	0.0140	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	6	0.0098	0.0012	0.0140	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00SA05JL0001

CN	TOTAL CYANIDE IN MG/L	11	0.0017	0.0012	0.0100	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	2	0.0095	0.0005	0.0100	0.0090
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00SA05JM0003

CN	TOTAL CYANIDE IN MG/L	12	0.0026	0.0014	0.0120	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	3	0.0103	0.0012	0.0120	0.0080
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00SA05JM0014

CN	TOTAL CYANIDE IN MG/L	109	0.0022	0.0002	0.0090	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	9	0.0071	0.0004	0.0090	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00SA05KH0002

CN	TOTAL CYANIDE IN MG/L	121	0.0057	0.0007	0.0540	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	36	0.0130	0.0018	0.0540	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	3	0.0437	0.0054	0.0540	0.0360

STATION=00SA05LC0001

CN	TOTAL CYANIDE IN MG/L	123	0.0060	0.0010	0.1000	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	32	0.0156	0.0034	0.1000	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	2	0.0840	0.0160	0.1000	0.0680

STATION=00SA05ND0002

CN	TOTAL CYANIDE IN MG/L	123	0.0057	0.0006	0.0360	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	42	0.0117	0.0011	0.0360	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	2	0.0340	0.0020	0.0360	0.0320

STATION=00SA05NA0002

CN	TOTAL CYANIDE IN MG/L	9	0.0049	0.0020	0.0160	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	3	0.0120	0.0023	0.0160	0.0080
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00SA05NB0001

CN	TOTAL CYANIDE IN MG/L	1	0.0090	.	0.0090	0.0090
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0090	.	0.0090	0.0090
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00SA05NB0009

CN	TOTAL CYANIDE IN MG/L	13	0.0018	0.0011	0.0130	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0130	.	0.0130	0.0130
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00SA05ND0001

CN	TOTAL CYANIDE IN MG/L	78	0.0059	0.0010	0.0570	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	28	0.0119	0.0025	0.0570	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	3	0.0480	0.0067	0.0570	0.0350

STATION=00SA05ND0007

CN	TOTAL CYANIDE IN MG/L	4	0	0	0	0
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.

GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00SA06AG0004						
CN	TOTAL CYANIDE IN MG/L	7	0.0021	0.0006	0.0040	0
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00SA06BB0004						
CN	TOTAL CYANIDE IN MG/L	20	0.0030	0.0005	0.0100	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	2	0.0085	0.0015	0.0100	0.0070
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00SA06CD0001						
CN	TOTAL CYANIDE IN MG/L	14	0.0018	0.0003	0.0030	0
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00SA06DA0001						
CN	TOTAL CYANIDE IN MG/L	12	0.0017	0.0003	0.0030	0
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00SA06EA0001						
CN	TOTAL CYANIDE IN MG/L	2	0.0145	0.0145	0.0290	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0290	.	0.0290	0.0290
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00SA06EA0003						
CN	TOTAL CYANIDE IN MG/L	87	0.0035	0.0005	0.0250	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	13	0.0139	0.0014	0.0250	0.0070
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE
STATION=00SA07LC0001						
CN	TOTAL CYANIDE IN MG/L	10	0.0011	0.0003	0.0020	0
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00SA07MA0001						
CN	TOTAL CYANIDE IN MG/L	13	0.0013	0.0003	0.0040	0
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.
STATION=00SA11AB0005						
CN	TOTAL CYANIDE IN MG/L	7	0.0020	0.0011	0.0070	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0070	.	0.0070	0.0070
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00SA11AB0006

CN	TOTAL CYANIDE IN MG/L	3	0.0060	0.0021	0.0090	0.0020
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	2	0.0080	0.0010	0.0090	0.0070
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00SA11AB0007

CN	TOTAL CYANIDE IN MG/L	3	0	0	0	0
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00SA11AC0001

CN	TOTAL CYANIDE IN MG/L	22	0.0025	0.0005	0.0060	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	3	0.0060	0.0000	0.0060	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00SA11AC0002

CN	TOTAL CYANIDE IN MG/L	29	0.0028	0.0003	0.0100	0.0010
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	2	0.0080	0.0020	0.0100	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00SA11AE0004

CN	TOTAL CYANIDE IN MG/L	1	0	.	0	0
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=00SA11AE0008

CN	TOTAL CYANIDE IN MG/L	42	0.0050	0.0006	0.0180	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	13	0.0098	0.0010	0.0180	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00US05NB0001

CN	TOTAL CYANIDE IN MG/L	46	0.0067	0.0012	0.0540	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	20	0.0115	0.0025	0.0540	0.0060
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	1	0.0540	.	0.0540	0.0540

STATION=01NW06LA0001

CN	TOTAL CYANIDE IN MG/L	1	0	.	0	0
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=01NW07SB0003

CN	TOTAL CYANIDE IN MG/L	13	0.0287	0.0165	0.1800	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	5	0.0746	0.0355	0.1800	0.0120
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	2	0.1600	0.0200	0.1800	0.1400

STATION=01NW07SB0006

CN	TOTAL CYANIDE IN MG/L	5	0.0010	0.0010	0.0050	0
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=01NW07SB0009

CN	TOTAL CYANIDE IN MG/L	6	0.0013	0.0013	0.0080	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0080	.	0.0080	0.0080
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=01NW10JA0001

CN	TOTAL CYANIDE IN MG/L	1	0.0210	.	0.0210	0.0210
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0210	.	0.0210	0.0210
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=01NW10JA0008

CN	TOTAL CYANIDE IN MG/L	2	0	0	0	0
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=01SA05JG0001

CN	TOTAL CYANIDE IN MG/L	12	0.0018	0.0014	0.0170	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0170	.	0.0170	0.0170
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=01SA06DA0001

CN	TOTAL CYANIDE IN MG/L	7	0.0010	0.0003	0.0020	0
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=10NW07PB0001

CN	TOTAL CYANIDE IN MG/L	7	0	0	0	0
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=10NW07PB0002

CN	TOTAL CYANIDE IN MG/L	7	0.0083	0.0070	0.0500	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	2	0.0290	0.0210	0.0500	0.0080
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	1	0.0500	.	0.0500	0.0500

STATION=10NW07PB0003

CN	TOTAL CYANIDE IN MG/L	3	0.0080	0.0080	0.0240	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0240	.	0.0240	0.0240
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=22NW07PB0004

CN	TOTAL CYANIDE IN MG/L	36	2.9887	0.3610	10.7000	0.0150
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	36	2.9887	0.3610	10.7000	0.0150

GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	35	3.0737	0.3610	10.7000	0.0400

STATION=22NW07PB0005

CN	TOTAL CYANIDE IN MG/L	31	3.0218	0.4351	9.8000	0.0090
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	31	3.0218	0.4351	9.8000	0.0090
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	29	3.2289	0.4394	9.8000	0.0410

STATION=22NW07SB0009

CN	TOTAL CYANIDE IN MG/L	12	25.9651	6.6654	78.0000	0.0310
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	12	25.9651	6.6654	78.0000	0.0310
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	12	25.9651	6.6654	78.0000	0.0310

STATION=22NW07SB0010

CN	TOTAL CYANIDE IN MG/L	4	17.0750	5.0404	26.5000	2.8000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	4	17.0750	5.0404	26.5000	2.8000
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	4	17.0750	5.0404	26.5000	2.8000

STATION=22NW07SB0011

CN	TOTAL CYANIDE IN MG/L	6	19.8710	4.8576	36.0000	0.0260
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	6	19.8710	4.8576	36.0000	0.0260
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	5	23.8400	3.4301	36.0000	16.0000

STATION=22NW07SB0012

CN	TOTAL CYANIDE IN MG/L	15	0.9093	0.2643	3.5000	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	14	0.9743	0.2752	3.5000	0.0110
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	13	1.0484	0.2862	3.5000	0.0790

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=22NW07SB0013

CN	TOTAL CYANIDE IN MG/L	15	0.1742	0.0679	0.9000	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	9	0.2903	0.0961	0.9000	0.0280
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	7	0.3653	0.1077	0.9000	0.0770

STATION=22NW07SB0014

CN	TOTAL CYANIDE IN MG/L	7	21.3844	8.0646	58.0000	0.0160
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	7	21.3844	8.0646	58.0000	0.0160
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	6	24.9458	8.5613	58.0000	1.1750

STATION=22NW07SB0016

CN	TOTAL CYANIDE IN MG/L	2	0.0700	0.0200	0.0900	0.0500
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	2	0.0700	0.0200	0.0900	0.0500
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	2	0.0700	0.0200	0.0900	0.0500

STATION=22NW07SB0017

CN	TOTAL CYANIDE IN MG/L	1	0.0150	.	0.0150	0.0150
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0150	.	0.0150	0.0150
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=22NW07SB0018

CN	TOTAL CYANIDE IN MG/L	10	16.9127	9.4010	79.0000	0.0270
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	10	16.9127	9.4010	79.0000	0.0270
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	9	18.7889	10.2992	79.0000	0.5000

STATION=22NW07SB0019

CN	TOTAL CYANIDE IN MG/L	9	2.1914	1.0581	8.9000	0.0050
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	8	2.4647	1.1590	8.9000	0.0440
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	8	2.4647	1.1590	8.9000	0.0440

STATION=22NW07SB0020

CN	TOTAL CYANIDE IN MG/L	12	3.7833	1.2243	11.0000	0.0380
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	12	3.7833	1.2243	11.0000	0.0380
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	12	3.7833	1.2243	11.0000	0.0380

STATION=22NW07SB0021

CN	TOTAL CYANIDE IN MG/L	1	0.1200	.	0.1200	0.1200
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.1200	.	0.1200	0.1200
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	1	0.1200	.	0.1200	0.1200

STATION=22NW07SB0022

CN	TOTAL CYANIDE IN MG/L	1	0	.	0	0
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=22NW07SB0025

CN	TOTAL CYANIDE IN MG/L	2	0	0	0	0
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=22NW10EA0003

CN	TOTAL CYANIDE IN MG/L	7	0.0100	0.0100	0.0700	0.0000
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0700	.	0.0700	0.0700
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	1	0.0700	.	0.0700	0.0700

STATION=22NW10EA0004

CN	TOTAL CYANIDE IN MG/L	6	0.9748	0.3639	2.4000	0.0290
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	6	0.9748	0.3639	2.4000	0.0290
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	5	1.1640	0.3807	2.4000	0.4300

STATION=22NW10EA0005

CN	TOTAL CYANIDE IN MG/L	10	15.0250	3.2187	39.0000	0.0500
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	10	15.0250	3.2187	39.0000	0.0500
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	10	15.0250	3.2187	39.0000	0.0500

STATION=22NW10EA0006

CN	TOTAL CYANIDE IN MG/L	6	8.3503	5.9823	36.0000	0.0090
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	6	8.3503	5.9823	36.0000	0.0090
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	3	16.6903	10.4587	36.0000	0.0710

STATION=22NW10EA0007

CN	TOTAL CYANIDE IN MG/L	2	0.0115	0.0065	0.0180	0.0050
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0180	.	0.0180	0.0180
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=22NW10JA0003

CN	TOTAL CYANIDE IN MG/L	1	0.0500	.	0.0500	0.0500
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0500	.	0.0500	0.0500
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	1	0.0500	.	0.0500	0.0500

STATION=22NW10JA0006

CN	TOTAL CYANIDE IN MG/L	1	0	.	0	0
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

STATION=22NW10JA0007

CN	TOTAL CYANIDE IN MG/L	1	0	.	0	0
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	0	.	.	.	.
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

TOTAL CYANIDE DATA BASE - SUMMARY STATISTICS 14:56 WEDNESDAY, APRIL 9, 1986

STATION=22NW10JA0008

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE
CN	TOTAL CYANIDE IN MG/L	1	0.0300	.	0.0300	0.0300
GT_5PPB	CYANIDE VALUES GREATER THAN 0.005 MG/L	1	0.0300	.	0.0300	0.0300
GT_30PPB	CYANIDE VALUES GREATER THAN 0.030 MG/L	0	.	.	.	.

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VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE
STATION=00AL05AA0001						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	9	8.66	1.83	15.00	1.00
STATION=00AL05AA0002						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	9	7.86	1.89	15.00	0
STATION=00AL05AA0003						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	9	8.11	1.91	14.00	0.50
STATION=00AL05AA0004						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	9	7.63	1.80	13.00	0
STATION=00AL05AA0005						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	11	6.36	1.54	14.00	0
STATION=00AL05AC0009						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	6	18.08	1.76	24.00	11.50
STATION=00AL05AD0005						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	75	6.44	0.63	18.00	0
STATION=00AL05AD0060						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	7	9.71	1.94	16.00	0.50
STATION=00AL05AE0001						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	82	6.21	0.64	21.00	0
STATION=00AL05AE0026						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	12	7.33	2.05	19.00	0
STATION=00AL05AG0001						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	10	11.10	3.02	24.00	0
STATION=00AL05AK0001						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	118	8.49	0.74	25.00	0
STATION=00AL05BA0011						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	8	4.75	1.65	14.50	0

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE
STATION=00AL05BD0002						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	5	6.10	2.71	14.00	0
STATION=00AL05BE0013						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	70	4.91	0.47	14.00	0
STATION=00AL05BJ0003						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	10	6.90	1.88	18.00	0
STATION=00AL05BL0001						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	10	6.75	1.57	13.50	0
STATION=00AL05BN0001						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	9	11.77	3.03	22.00	0
STATION=00AL05CA0001						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	11	7.59	1.94	17.00	0.50
STATION=00AL05CE0001						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	9	10.38	3.27	23.00	0
STATION=00AL05CK0001						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	120	8.52	0.74	27.00	0
STATION=00AL05DA0001						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	2	2.50	1.50	4.00	1.00
STATION=00AL05DA0002						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	6	5.83	1.58	10.00	1.00
STATION=00AL05DB0006						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	9	9.61	2.17	17.00	1.00
STATION=00AL05DC0001						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	8	10.18	1.95	16.00	1.00
STATION=00AL05EC0004						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	8	10.43	2.67	19.00	0

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00AL05EF0001 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	25	7.33	1.55	21.00	0

STATION=00AL06AD0001 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	116	7.75	0.71	24.50	0

STATION=00AL07AA0007 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	4	7.37	2.64	12.00	0.50

STATION=00AL07AA0015 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	5	7.00	2.16	14.00	1.00

STATION=00AL07AA0023 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	75	4.90	0.48	13.00	0

STATION=00AL07BB0003 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	9	10.06	3.04	24.00	0.50

STATION=00AL07BC0001 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	9	11.94	3.13	25.00	0

STATION=00AL07BE0001 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	9	9.22	2.94	23.00	0.50

STATION=00AL07CD0001 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	9	8.47	2.53	16.00	0

STATION=00AL07DA0001 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	10	9.00	2.34	17.00	0

STATION=00AL07DA0003 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	12	10.40	2.33	22.00	0

STATION=00AL07GA0002 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	2	4.50	4.50	9.00	0

STATION=00AL07GE0001 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	10	7.90	2.45	20.50	0

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00AL07GJ0001 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	9	10.11	2.64	21.00	0.50

STATION=00AL11AA0001 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	14	8.93	1.86	18.00	0

STATION=00AL11AA0002 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	14	9.85	2.17	24.00	0

STATION=00AL11AA0003 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	79	7.89	0.80	21.00	0

STATION=00AL11AA0014 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	2	11.00	4.00	15.00	7.00

STATION=00MA05JM0001 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	14	8.41	2.30	25.00	0

STATION=00MA05KH0001 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	114	7.04	0.73	23.50	0

STATION=00MA05LD0001 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	69	7.87	0.92	23.00	0

STATION=00MA05LE0002 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	15	11.16	2.27	23.50	0.50

STATION=00MA05LE0003 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	15	11.00	2.25	24.00	0.50

STATION=00MA05LH0001 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	12	8.37	2.58	25.00	0

STATION=00MA05LJ0001 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	12	8.58	2.54	25.00	0

STATION=00MA05LM0004 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	9	10.66	2.93	25.00	0

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00MA05MH0001 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	12	10.01	2.80	27.50	0

STATION=00MA05MH0003 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	1	0.50	.	0.50	0.50

STATION=00MA05MJ0017						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	12	9.33	2.65	25.00	0
STATION=00MA05MJ0035						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	1	0.50	.	0.50	0.50
STATION=00MA05NF0001						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	75	8.39	0.96	28.00	0
STATION=00MA05NF0005						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	6	14.33	3.89	25.00	0
STATION=00MA05NF0009						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	7	12.35	3.91	25.00	0
STATION=00MA05NG0001						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	12	8.91	2.56	24.00	0
STATION=00MA05NG0004						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	1	0.50	.	0.50	0.50
STATION=00MA05NG0013						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	41	9.47	1.44	29.00	0
STATION=00MA05NG0014						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	1	0.50	.	0.50	0.50
STATION=00MA05NG0018						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	1	18.00	.	18.00	18.00
STATION=00MA05OA0003						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	10	11.60	2.74	24.50	0

TOTAL CYANIDE DATA BASE - SUMMARY STATISTICS FOR FIELD TEMPERATURE 11:30 FRIDAY, MARCH 21, 1986

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE
STATION=00MA05OB0001						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	72	8.78	1.00	27.00	0
STATION=00MA05OB0011						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	4	11.50	3.02	20.50	7.50
STATION=00MA05OB0014						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	4	11.37	3.07	20.50	7.00

STATION=00MA05DC0001

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	90	9.03	0.95	26.00	0

STATION=00MA05DD0001

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	82	8.66	0.96	25.00	0

STATION=00MA05DD0007

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	10	10.75	2.42	23.00	0.50

STATION=00MA05DD0012

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	13	9.30	2.29	23.00	0

STATION=00MA05DJ0001

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	11	10.63	2.81	25.00	0

STATION=00MA05PF0022

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	76	7.18	0.86	22.50	0

STATION=00MA05RA0004

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	13	8.76	2.32	23.50	0

STATION=00MA05SH0001

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	12	7.62	2.30	23.00	0

STATION=00NW07PB0004

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	1	13.00	.	13.00	13.00

STATION=00NW07SB0003

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	9	8.33	2.94	19.00	0

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00NW07SB0005

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=00NW07SB0006

[illegible]	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	

[illegible]ION=00NW07SB0008

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	4	8.50	4.03	18.00	0

STATION=00NW10EA0001

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	9	1.88	0.69	6.00	0

STATION=00NW10EA0002

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	7	2.42	0.92	6.50	-1.00

STATION=00NW10EA0003

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	4	2.90	0.73	4.60	1.00

STATION=00NW10EA0005

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	5	2.86	1.34	7.50	0

STATION=00NW10JA0002

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	1	17.00	.	17.00	17.00

STATION=00NW10JA0005

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	1	15.00	.	15.00	15.00

STATION=00SA05EF0001

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	93	7.90	0.81	25.00	0

STATION=00SA05FE0001

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	119	7.62	0.72	23.00	0

STATION=00SA05GC0001

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	12	9.10	2.47	20.00	0

STATION=00SA05GG0001

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	12	9.49	2.68	21.50	0

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00SA05GG0003

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	11	6.13	2.45	22.00	0

STATION=00SA05HD0004

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	11	9.46	2.97	25.00	0.20

STATION=00SA05HH0002

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	12	10.51	2.69	22.00	0

STATION=00SA05HH0004

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	1	2.50	.	2.50	2.50

STATION=00SA05HH0007

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	8	7.75	3.11	22.00	0

STATION=00SA05JC0002

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	11	12.20	2.93	25.60	0.20

STATION=00SA05JE0002

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	12	9.62	2.96	27.10	0.10

STATION=00SA05JF0002

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	9	9.78	3.34	24.30	0.10

STATION=00SA05JK0002

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	19	8.38	1.93	21.50	0

STATION=00SA05JL0001

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	11	10.63	2.61	24.70	0.10

STATION=00SA05JM0003

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	12	9.65	2.87	26.20	0

STATION=00SA05JM0014

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	109	8.13	0.80	26.00	0

STATION=00SA05KH0002

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	121	7.44	0.73	24.00	0

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00SA05LC0001

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	123	7.45	0.74	27.00	0

STATION=00SA05MD0002

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	122	7.84	0.75	25.00	0

STATION=00SA05NA0002

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	9	12.00	2.31	22.50	1.80

STATION=00SA05NB0001

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	1	0.20	.	0.20	0.20

STATION=00SA05NB0009

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	12	12.95	2.39	22.00	0

STATION=00SA05ND0001

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	78	8.86	0.97	25.00	0

STATION=00SA05ND0007

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	4	10.87	3.89	21.00	4.50

STATION=00SA06A60004

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	7	10.35	3.23	23.00	0

STATION=00SA06BB0004

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	20	10.50	1.48	20.50	0.50

STATION=00SA06CD0001

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	14	10.35	1.84	21.00	0

STATION=00SA06DA0001

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	12	10.16	1.79	21.00	0.50

STATION=00SA06EA0001

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	2	0.50	0	0.50	0.50

STATION=00SA06EA0003

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	87	7.81	0.78	22.00	0

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE
STATION=00SA07LC0001						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	10	7.35	1.78	17.00	0
STATION=00SA07MA0001						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	13	10.15	1.78	20.00	0
STATION=00SA11AB0005						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	7	15.97	2.55	21.20	4.00
STATION=00SA11AB0006						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	3	15.76	2.61	20.80	12.00
STATION=00SA11AB0007						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	3	13.63	5.32	20.30	3.10
STATION=00SA11AC0001						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	20	7.44	1.86	24.50	0
STATION=00SA11AC0002						
TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	29	11.24	1.40	24.00	0

STATION=00SA11AE0004

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	1	9.00	.	9.00	9.00

STATION=00SA11AE0008

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	42	9.2[illegible]	1.21	25.00	0

STATION=00US05NB0001

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	20	10.75	1.89	25.00	0

STATION=01NW06LA0001

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	1	1.00	.	1.00	1.00

STATION=01NW07SB0003

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	7	5.28	3.08	17.00	-1.00

STATION=01NW07SB0006

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	2	4.00	4.00	8.00	0

TOTAL CYANIDE DATA BASE - SUMMARY STATISTICS FOR FIELD TEMPERATURE 11:30 FRIDAY, MARCH 21, 1986

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=01NW07SB0009

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	2	6.75	6.75	13.50	0

STATION=01NW10JA0001

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=01NW10JA0008

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	2	17.00	0	17.00	17.00

STATION=01SA05J60001

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	12	9.30	2.70	25.40	0.50

STATION=01SA06DA0001

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	7	6.71	2.39	19.00	0

STATION=10NW07PB0001

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=10NW07PB0002

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=10NW07PB0003

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=22NW07PB0004 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=22NW07PB0005 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=22NW07SB0009 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=22NW07SB0010 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=22NW07SB0011 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=22NW07SB0012 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=22NW07SB0013 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=22NW07SB0014 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=22NW07SB0016 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=22NW07SB0017 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=22NW07SB0018 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=22NW07SB0019 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=22NW07SB0020 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=22NW07SB0021 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=22NW07SB0022 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=22NW07SB0025 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=22NW10EA0003 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=22NW10EA0004 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=22NW10EA0005 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=22NW10EA0006 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=22NW10EA0007 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=22NW10JA0003 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=22NW10JA0006 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=22NW10JA0007 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

STATION=22NW10JA0008 ----------

TEMP_F	FIELD TEMPERATURE IN DEGREES CELCIUS	0	.	.	.	.

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VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE
STATION=00AL05AA0001						
PH_F	FIELD PH	9	8.11	0.06	8.40	7.80
STATION=00AL05AA0002						
PH_F	FIELD PH	8	8.18	0.06	8.50	8.00
STATION=00AL05AA0003						
PH_F	FIELD PH	9	8.13	0.07	8.40	7.70
STATION=00AL05AA0004						
PH_F	FIELD PH	9	8.06	0.08	8.50	7.80
STATION=00AL05AA0005						
PH_F	FIELD PH	11	8.25	0.07	8.60	7.80
STATION=00AL05AC0009						
PH_F	FIELD PH	6	8.31	0.14	8.70	7.90
STATION=00AL05AD0005						
PH_F	FIELD PH	71	8.01	0.03	8.50	7.50
STATION=00AL05AD0060						
PH_F	FIELD PH	7	7.78	0.07	8.10	7.60
STATION=00AL05AE0001						
PH_F	FIELD PH	77	8.06	0.02	8.50	7.50
STATION=00AL05AE0026						
PH_F	FIELD PH	12	8.18	0.10	8.70	7.60
STATION=00AL05AG0001						
PH_F	FIELD PH	10	8.13	0.14	8.70	7.30
STATION=00AL05AK0001						
PH_F	FIELD PH	116	8.20	0.03	9.20	7.10
STATION=00AL05BA0011						
PH_F	FIELD PH	7	8.17	0.09	8.40	7.80

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE
STATION=00AL05BD0002						
PH_F	FIELD PH	5	8.06	0.08	8.30	7.90
STATION=00AL05BE0013						
PH_F	FIELD PH	69	8.17	0.02	8.60	7.60
STATION=00AL05BJ0003						
PH_F	FIELD PH	9	8.16	0.07	8.40	7.80
STATION=00AL05BL0001						
PH_F	FIELD PH	9	8.25	0.05	8.40	7.90
STATION=00AL05BN0001						
PH_F	FIELD PH	9	8.37	0.12	9.10	8.00
STATION=00AL05CA0001						
PH_F	FIELD PH	11	8.12	0.06	8.40	7.70
STATION=00AL05CE0001						
PH_F	FIELD PH	9	8.11	0.08	8.50	7.60
STATION=00AL05CK0001						
PH_F	FIELD PH	118	8.06	0.02	8.60	7.20
STATION=00AL05DA0001						
PH_F	FIELD PH	2	8.30	0	8.30	8.30
STATION=00AL05DA0002						
PH_F	FIELD PH	6	8.01	0.14	8.40	7.50
STATION=00AL05DB0006						
PH_F	FIELD PH	9	8.06	0.07	8.30	7.60
STATION=00AL05DC0001						
PH_F	FIELD PH	8	8.11	0.10	8.40	7.50
STATION=00AL05EC0004						
PH_F	FIELD PH	8	8.12	0.10	8.60	7.60

TOTAL CYANIDE DATA BASE - SUMMARY STATISTICS FOR FIELD PH 11:39 WEDNESDAY, APRIL 2, 1986

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00AL05EF0001 ----------

PH_F	FIELD PH	24	8.15	0.09	9.10	7.40

STATION=00AL06AD0001 ----------

PH_F	FIELD PH	115	7.72	0.04	8.40	5.90

STATION=00AL07AA0007 ----------

PH_F	FIELD PH	4	7.90	0.07	8.00	7.70

STATION=00AL07AA0015 ----------

PH_F	FIELD PH	5	7.94	0.14	8.20	7.40

STATION=00AL07AA0023 ----------

PH_F	FIELD PH	74	8.16	0.02	8.60	7.40

STATION=00AL07BB0003 ----------

PH_F	FIELD PH	8	7.91	0.15	8.70	7.50

STATION=00AL07BC0001 ----------

PH_F	FIELD PH	8	7.80	0.14	8.30	7.20

STATION=00AL07BE0001 ----------

PH_F	FIELD PH	9	7.87	0.11	8.40	7.50

STATION=00AL07CD0001 ----------

PH_F	FIELD PH	9	7.63	0.18	8.20	6.60

STATION=00AL07DA0001 ----------

PH_F	FIELD PH	9	7.88	0.13	8.20	7.20

STATION=00AL07DA0003 ----------

PH_F	FIELD PH	10	7.61	0.22	8.30	6.10

STATION=00AL07GA0002 ----------

PH_F	FIELD PH	2	8.30	0.20	8.50	8.10

STATION=00AL07GE0001 ----------

PH_F	FIELD PH	10	8.04	0.12	8.40	7.50

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00AL07GJ0001 ----------

PH_F	FIELD PH	8	7.93	0.09	8.30	7.60

STATION=00AL11AA0001

PH_F	FIELD PH	13	8.14	0.06	8.50	7.80

STATION=00AL11AA0002

PH_F	FIELD PH	13	8.20	0.08	8.60	7.70

STATION=00AL11AA0003

PH_F	FIELD PH	75	8.18	0.04	8.80	6.90

STATION=00AL11AA0014

PH_F	FIELD PH	2	8.25	0.35	8.60	7.90

STATION=00MA05JM0001

PH_F	FIELD PH	13	8.25	0.05	8.60	7.80

STATION=00MA05KH0001

PH_F	FIELD PH	113	7.86	0.02	8.50	7.10

STATION=00MA05LD0001

PH_F	FIELD PH	69	7.54	0.06	8.60	6.30

STATION=00MA05LE0002

PH_F	FIELD PH	14	7.91	0.10	8.50	7.30

STATION=00MA05LE0003

PH_F	FIELD PH	15	7.82	0.08	8.40	7.40

STATION=00MA05LH0001

PH_F	FIELD PH	12	8.05	0.13	8.70	7.35

STATION=00MA05LJ0001

PH_F	FIELD PH	12	8.10	0.08	8.50	7.50

STATION=00MA05LM0004

PH_F	FIELD PH	9	8.19	0.13	8.80	7.50

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00MA05MH0001

PH_F	FIELD PH	11	8.13	0.08	8.60	7.70

STATION=00MA05MH0003

PH_F	FIELD PH	1	8.10	.	8.10	8.10

STATION=00MA05MJ0017

PH_F	FIELD PH	12	8.16	0.14	9.60	7.80

STATION=00MA05MJ0035

PH_F	FIELD PH	1	8.10	.	8.10	8.10

STATION=00MA05NF0001

PH_F	FIELD PH	75	8.11	0.05	9.30	7.20

STATION=00MA05NF0005

PH_F	FIELD PH	6	7.78	0.08	8.10	7.50

STATION=00MA05NF0009

PH_F	FIELD PH	7	7.78	0.13	8.40	7.40

STATION=00MA05NG0001

PH_F	FIELD PH	12	8.10	0.11	8.75	7.60

STATION=00MA05NG0004

PH_F	FIELD PH	1	7.60	.	7.60	7.60

STATION=00MA05NG0013

PH_F	FIELD PH	41	8.10	0.05	8.90	7.50

STATION=00MA05NG0014

PH_F	FIELD PH	1	7.90	.	7.90	7.90

STATION=00MA05NG0018

PH_F	FIELD PH	1	8.30	.	8.30	8.30

STATION=00MA05OA0003

PH_F	FIELD PH	10	8.11	0.11	8.60	7.50

TOTAL CYANIDE DATA BASE - SUMMARY STATISTICS FOR FIELD PH 11:39 WEDNESDAY, APRIL 2, 1986

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00MA05OB0001

PH_F	FIELD PH	72	8.01	0.03	8.60	7.25

STATION=00MA05OB0011

PH_F	FIELD PH	4	8.02	0.27	8.30	7.20

STATION=00MA05OB0014

PH_F	FIELD PH	4	7.75	0.20	8.10	7.30

STATION=00MA05DC0001 ----------

PH_F	FIELD PH	90	7.96	0.03	8.90	7.20

STATION=00MA05DD0001 ----------

PH_F	FIELD PH	82	7.79	0.04	8.80	6.50

STATION=00MA05DD0007 ----------

PH_F	FIELD PH	10	7.64	0.17	8.40	6.30

STATION=00MA05DD0012 ----------

PH_F	FIELD PH	13	7.78	0.16	8.40	6.20

STATION=00MA05DJ0001 ----------

PH_F	FIELD PH	11	8.14	0.15	9.30	7.60

STATION=00MA05PF0022 ----------

PH_F	FIELD PH	76	7.61	0.04	9.30	7.10

STATION=00MA05RA0004 ----------

PH_F	FIELD PH	13	7.33	0.05	7.80	7.15

STATION=00MA05SH0001 ----------

PH_F	FIELD PH	12	7.95	0.10	8.50	7.40

STATION=00NW07PB0004 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=00NW07SB0003 ----------

PH_F	FIELD PH	1	8.00	.	8.00	8.00

TOTAL CYANIDE DATA BASE - SUMMARY STATISTICS FOR FIELD PH 11:39 WEDNESDAY, APRIL 2, 1986

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00NW07SB0005 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=00NW07SB0006 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=00NW07SB0008 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=00NW10EA0001 ----------

PH_F	FIELD PH	6	7.78	0.14	8.20	7.30

STATION=00NW10EA0002 ----------

PH_F	FIELD PH	4	7.77	0.13	8.00	7.40

STATION=00NW10EA0003 ----------

PH_F	FIELD PH	3	8.20	0.11	8.40	8.00

STATION=00NW10EA0005 ----------

PH_F	FIELD PH	6	8.03	0.17	8.40	7.30

STATION=00NW10JA0002 ----------

PH_F	FIELD PH	1	7.10	.	7.10	7.10

STATION=00NW10JA0005 ----------

PH_F	FIELD PH	1	8.80	.	8.80	8.80

STATION=00SA05EF0001 ----------

PH_F	FIELD PH	93	7.97	0.04	9.00	7.10

STATION=00SA05FE0001 ----------

PH_F	FIELD PH	118	8.06	0.04	8.80	7.00

STATION=00SA056C0001 ----------

PH_F	FIELD PH	12	8.23	0.21	9.40	7.10

STATION=00SA05660001 ----------

PH_F	FIELD PH	12	7.95	0.15	8.50	6.90

TOTAL CYANIDE DATA BASE - SUMMARY STATISTICS FOR FIELD PH 11:39 WEDNESDAY, APRIL 2, 1986

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00SA05660003 ----------

PH_F	FIELD PH	10	8.03	0.17	8.90	7.20

STATION=00SA05HD0004 ----------

PH_F	FIELD PH	11	8.32	0.17	9.10	7.20

STATION=00SA05HH0002 ----------

PH_F	FIELD PH	12	8.36	0.14	9.20	7.40

STATION=00SA05HH0004 ----------

PH_F	FIELD PH	1	8.50	.	8.50	8.50

STATION=00SA05HH0007 ----------

PH_F	FIELD PH	7	8.18	0.12	8.60	7.70

STATION=00SA05JC0002 ----------

PH_F	FIELD PH	11	8.55	0.27	10.10	7.00

STATION=00SA05JE0002 ----------

PH_F	FIELD PH	12	8.02	0.18	9.30	7.30

STATION=00SA05JF0002 ----------

PH_F	FIELD PH	9	7.96	0.19	9.10	7.10

STATION=00SA05JK0002 ----------

PH_F	FIELD PH	19	8.52	0.17	9.60	7.30

STATION=00SA05JL0001 ----------

PH_F	FIELD PH	11	8.63	0.10	9.20	8.10

STATION=00SA05JM0003 ----------

PH_F	FIELD PH	12	8.49	0.05	9.00	7.90

STATION=00SA05JM0014 ----------

PH_F	FIELD PH	107	8.19	0.02	8.80	7.60

STATION=00SA05KH0002 ----------

PH_F	FIELD PH	121	7.54	0.03	8.50	6.80

TOTAL CYANIDE DATA BASE - SUMMARY STATISTICS FOR FIELD PH 11:39 WEDNESDAY, APRIL 2, 1986

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00SA05LC0001 ----------

PH_F	FIELD PH	122	7.88	0.03	8.70	7.10

STATION=00SA05MD0002 ----------

PH_F	FIELD PH	121	7.83	0.03	8.60	6.50

STATION=00SA05NA0002 ----------

PH_F	FIELD PH	9	8.05	0.18	8.90	7.10

STATION=00SA05NB0001 ----------

PH_F	FIELD PH	1	8.20	.	8.20	8.20

STATION=00SA05NB0009 ----------

PH_F	FIELD PH	12	8.10	0.11	8.90	7.60

STATION=00SA05ND0001 ----------

PH_F	FIELD PH	76	7.97	0.03	8.80	6.80

STATION=00SA05ND0007 ----------

PH_F	FIELD PH	4	8.50	0.12	8.80	8.20

STATION=00SA06AG0004 ----------

PH_F	FIELD PH	5	7.96	0.18	8.40	7.40

STATION=00SA06BB0004 ----------

PH_F	FIELD PH	19	8.00	0.12	8.80	6.60

STATION=00SA06CD0001 ----------

PH_F	FIELD PH	12	7.66	0.10	8.10	7.00

STATION=00SA06DA0001 ----------

PH_F	FIELD PH	10	7.39	0.14	8.20	6.70

STATION=00SA06EA0001 ----------

PH_F	FIELD PH	2	8.35	0.05	8.40	8.30

STATION=00SA06EA0003 ----------

PH_F	FIELD PH	87	7.26	0.04	8.40	6.20

TOTAL CYANIDE DATA BASE - SUMMARY STATISTICS FOR FIELD PH 11:39 WEDNESDAY, APRIL 2, 1986

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE
STATION=00SA07LC0001 ----------						
PH_F	FIELD PH	9	7.37	0.15	7.80	6.30
STATION=00SA07MA0001 ----------						
PH_F	FIELD PH	11	7.52	0.10	7.90	6.70
STATION=00SA11AB0005 ----------						
PH_F	FIELD PH	7	8.97	0.27	10.20	7.90
STATION=00SA11AB0006 ----------						
PH_F	FIELD PH	3	8.10	0.25	8.60	7.80
STATION=00SA11AB0007 ----------						
PH_F	FIELD PH	3	8.50	0.05	8.60	8.40
STATION=00SA11AC0001 ----------						
PH_F	FIELD PH	20	7.71	0.10	8.60	6.90
STATION=00SA11AC0002 ----------						
PH_F	FIELD PH	29	8.32	0.05	8.70	7.40

STATION=00SA11AE0004

PH_F	FIELD PH	1	6.40	.	6.40	6.40

STATION=00SA11AE0008

PH_F	FIELD PH	42	8.07	0.04	8.60	7.40

STATION=00US05NB0001

PH_F	FIELD PH	20	8.02	0.08	9.00	7.40

STATION=01NW06LA0001

PH_F	FIELD PH	0	.	.	.	.

STATION=01NW07SB0003

PH_F	FIELD PH	0	.	.	.	.

STATION=01NW07SB0006

PH_F	FIELD PH	0	.	.	.	.

STATION=01NW07SB0009

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE
PH_F	FIELD PH	0	.	.	.	.

STATION=01NW10JA0001

PH_F	FIELD PH	0	.	.	.	.

STATION=01NW10JA0008

PH_F	FIELD PH	1	8.40	.	8.40	8.40

STATION=01SA05JG0001

PH_F	FIELD PH	12	8.35	0.19	9.30	7.40

STATION=01SA06DA0001

PH_F	FIELD PH	6	7.45	0.19	7.80	6.50

STATION=10NW07PB0001

PH_F	FIELD PH	0	.	.	.	.

STATION=10NW07PB0002

PH_F	FIELD PH	0	.	.	.	.

STATION=10NW07PB0003

PH_F	FIELD PH	0	.	.	.	.

STATION=22NW07PB0004 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=22NW07PB0005 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=22NW07SB0009 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=22NW07SB0010 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=22NW07SB0011 ----------

PH_F	FIELD PH	0	.	.	.	.

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=22NW07SB0012 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=22NW07SB0013 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=22NW07SB0014 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=22NW07SB0016 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=22NW07SB0017 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=22NW07SB0018 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=22NW07SB0019 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=22NW07SB0020 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=22NW07SB0021 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=22NW07SB0022 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=22NW07SB0025 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=22NW10EA0003 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=22NW10EA0004 ----------

PH_F	FIELD PH	0	.	.	.	.

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=22NW10EA0005 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=22NW10EA0006 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=22NW10EA0007 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=22NW10JA0003 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=22NW10JA0006 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=22NW10JA0007 ----------

PH_F	FIELD PH	0	.	.	.	.

STATION=22NW10JA0008 ----------

PH_F	FIELD PH	0	.	.	.	.

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STATION=00SA11AE0004

COND_F	FIELD CONDUCTIVITY	1	851.0000	.	851.0000	851.0000

STATION=00SA11AE0008

COND_F	FIELD CONDUCTIVITY	42	1305.5952	38.0479	1620.0000	624.0000

STATION=00US05NB0001

COND_F	FIELD CONDUCTIVITY	20	1146.4000	121.8747	2100.0000	352.0000

STATION=01NW06LA0001

COND_F	FIELD CONDUCTIVITY	0	.	.	.	.

STATION=01NW07SB0003

COND_F	FIELD CONDUCTIVITY	1	41.0000	.	41.0000	41.0000

STATION=01NW07SB0006

COND_F	FIELD CONDUCTIVITY	0	.	.	.	.

STATION=01NW07SB0009

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE
COND_F	FIELD CONDUCTIVITY	0	.	.	.	.

STATION=01NW10JA0001

COND_F	FIELD CONDUCTIVITY	0	.	.	.	.

STATION=01NW10JA0008

COND_F	FIELD CONDUCTIVITY	0	.	.	.	.

STATION=01SA05JG0001

COND_F	FIELD CONDUCTIVITY	12	569.0833	34.3055	850.0000	425.0000

STATION=01SA06DA0001

COND_F	FIELD CONDUCTIVITY	6	28.6667	1.3333	33.0000	25.0000

STATION=10NW07PB0001

COND_F	FIELD CONDUCTIVITY	0	.	.	.	.

STATION=10NW07PB0002

COND_F	FIELD CONDUCTIVITY	0	.	.	.	.

STATION=10NW07PB0003

COND_F	FIELD CONDUCTIVITY	0	.	.	.	.

STATION=22NW07PB0004 ----------

COND_F FIELD CONDUCTIVITY 0 . . . .

STATION=22NW07PB0005 ----------

COND_F FIELD CONDUCTIVITY 0 . . . .

STATION=22NW07SB0009 ----------

COND_F FIELD CONDUCTIVITY 0 . . . .

STATION=22NW07SB0010 ----------

COND_F FIELD CONDUCTIVITY 0 . . . .

STATION=22NW07SB0011 ----------

COND_F FIELD CONDUCTIVITY 0 . . . .

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE
STATION=22NW07SB0012 ----------						
COND_F	FIELD CONDUCTIVITY	0	.	.	.	.
STATION=22NW07SB0013 ----------						
COND_F	FIELD CONDUCTIVITY	0	.	.	.	.
STATION=22NW07SB0014 ----------						
COND_F	FIELD CONDUCTIVITY	0	.	.	.	.
STATION=22NW07SB0016 ----------						
COND_F	FIELD CONDUCTIVITY	0	.	.	.	.
STATION=22NW07SB0017 ----------						
COND_F	FIELD CONDUCTIVITY	0	.	.	.	.
STATION=22NW07SB0018 ----------						
COND_F	FIELD CONDUCTIVITY	0	.	.	.	.
STATION=22NW07SB0019 ----------						
COND_F	FIELD CONDUCTIVITY	0	.	.	.	.
STATION=22NW07SB0020 ----------						
COND_F	FIELD CONDUCTIVITY	0	.	.	.	.
STATION=22NW07SB0021 ----------						
COND_F	FIELD CONDUCTIVITY	0	.	.	.	.

STATION=22NW07SB0022 ----------

COND_F FIELD CONDUCTIVITY 0 . . . .

STATION=22NW07SB0025 ----------

COND_F FIELD CONDUCTIVITY 0 . . . .

STATION=22NW10EA0003 ----------

COND_F FIELD CONDUCTIVITY 0 . . . .

STATION=22NW10EA0004 ----------

COND_F FIELD CONDUCTIVITY 0 . . . .

TOTAL CYANIDE DATA BASE - SUMMARY STATISTICS FOR FIELD CONDUCTIVITY 11:43 WEDNESDAY, APRIL 2, 1986

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=22NW10EA0005 ----------

COND_F FIELD CONDUCTIVITY 0 . . . .

STATION=22NW10EA0006 ----------

COND_F FIELD CONDUCTIVITY 0 . . . .

STATION=22NW10EA0007 ----------

COND_F FIELD CONDUCTIVITY 0 . . . .

STATION=22NW10JA0003 ----------

COND_F FIELD CONDUCTIVITY 0 . . . .

STATION=22NW10JA0006 ----------

COND_F FIELD CONDUCTIVITY 0 . . . .

STATION=22NW10JA0007 ----------

COND_F FIELD CONDUCTIVITY 0 . . . .

STATION=22NW10JA0008 ----------

COND_F FIELD CONDUCTIVITY 0 . . . .

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VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE
STATION=00AL05AA0001						
COND_F	FIELD CONDUCTIVITY	4	298.2500	17.4565	338.0000	260.0000
STATION=00AL05AA0002						
COND_F	FIELD CONDUCTIVITY	6	328.1667	16.4203	370.0000	280.0000
STATION=00AL05AA0003						
COND_F	FIELD CONDUCTIVITY	6	330.1667	12.9188	372.0000	297.0000
STATION=00AL05AA0004						
COND_F	FIELD CONDUCTIVITY	5	237.8000	10.6461	270.0000	213.0000
STATION=00AL05AA0005						
COND_F	FIELD CONDUCTIVITY	6	317.6667	27.9305	420.0000	230.0000
STATION=00AL05AC0009						
COND_F	FIELD CONDUCTIVITY	3	493.6667	77.2665	646.0000	395.0000
STATION=00AL05AD0005						
COND_F	FIELD CONDUCTIVITY	58	171.6552	5.3130	420.0000	125.0000
STATION=00AL05AD0060						
COND_F	FIELD CONDUCTIVITY	4	151.2500	5.5283	160.0000	137.0000
STATION=00AL05AE0001						
COND_F	FIELD CONDUCTIVITY	65	199.4769	4.8842	330.0000	142.0000
STATION=00AL05AE0026						
COND_F	FIELD CONDUCTIVITY	5	392.2000	16.0574	440.0000	356.0000
STATION=00AL05AG0001						
COND_F	FIELD CONDUCTIVITY	4	352.2500	45.7263	480.0000	265.0000
STATION=00AL05AK0001						
COND_F	FIELD CONDUCTIVITY	105	393.8667	7.1888	621.0000	230.0000
STATION=00AL05BA0011						
COND_F	FIELD CONDUCTIVITY	6	178.8333	15.3719	230.0000	140.0000

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE
STATION=00AL05BD0002						
COND_F	FIELD CONDUCTIVITY	2	245.0000	35.0000	280.0000	210.0000
STATION=00AL05BE0013						
COND_F	FIELD CONDUCTIVITY	63	291.2857	6.9531	410.0000	190.0000
STATION=00AL05BJ0003						
COND_F	FIELD CONDUCTIVITY	5	343.4000	17.6057	385.0000	292.0000
STATION=00AL05BL0001						
COND_F	FIELD CONDUCTIVITY	5	306.2000	22.8548	360.0000	241.0000
STATION=00AL05BN0001						
COND_F	FIELD CONDUCTIVITY	3	332.6667	18.9414	355.0000	295.0000
STATION=00AL05CA0001						
COND_F	FIELD CONDUCTIVITY	5	334.6000	30.1921	440.0000	270.0000
STATION=00AL05CE0001						
COND_F	FIELD CONDUCTIVITY	5	358.6000	38.5883	465.0000	291.0000
STATION=00AL05CK0001						
COND_F	FIELD CONDUCTIVITY	104	503.9519	14.7769	959.0000	320.0000
STATION=00AL05DA0001						
COND_F	FIELD CONDUCTIVITY	2	315.0000	25.0000	340.0000	290.0000
STATION=00AL05DA0002						
COND_F	FIELD CONDUCTIVITY	4	171.7500	23.0086	224.0000	115.0000
STATION=00AL05DB0006						
COND_F	FIELD CONDUCTIVITY	5	401.0000	32.3079	500.0000	314.0000
STATION=00AL05DC0001						
COND_F	FIELD CONDUCTIVITY	3	291.0000	14.2945	310.0000	263.0000
STATION=00AL05EC0004						
COND_F	FIELD CONDUCTIVITY	4	315.5000	25.6953	390.0000	272.0000

TOTAL CYANIDE DATA BASE - SUMMARY STATISTICS FOR FIELD CONDUCTIVITY 11:43 WEDNESDAY, APRIL 2, 1986

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00AL05EF0001 ----------

COND_F	FIELD CONDUCTIVITY	25	360.2000	7.0200	447.0000	292.0000

STATION=00AL06AD0001 ----------

COND_F	FIELD CONDUCTIVITY	102	397.9412	11.2650	626.0000	181.0000

STATION=00AL07AA0007 ----------

COND_F	FIELD CONDUCTIVITY	2	132.0000	22.0000	154.0000	110.0000

STATION=00AL07AA0015 ----------

COND_F	FIELD CONDUCTIVITY	4	177.2500	29.3723	255.0000	115.0000

STATION=00AL07AA0023 ----------

COND_F	FIELD CONDUCTIVITY	67	203.8060	5.9030	335.0000	96.0000

STATION=00AL07BB0003 ----------

COND_F	FIELD CONDUCTIVITY	5	216.4000	15.5068	256.0000	163.0000

STATION=00AL07BC0001 ----------

COND_F	FIELD CONDUCTIVITY	4	296.2500	49.0856	440.0000	229.0000

STATION=00AL07BE0001 ----------

COND_F	FIELD CONDUCTIVITY	4	301.0000	63.7717	459.0000	195.0000

STATION=00AL07CD0001 ----------

COND_F	FIELD CONDUCTIVITY	3	192.0000	26.0576	235.0000	145.0000

STATION=00AL07DA0001 ----------

COND_F	FIELD CONDUCTIVITY	3	265.6667	39.1847	340.0000	207.0000

STATION=00AL07DA0003 ----------

COND_F	FIELD CONDUCTIVITY	6	295.1667	19.2517	350.0000	213.0000

STATION=00AL07GA0002 ----------

COND_F	FIELD CONDUCTIVITY	0	.	.	.	.

STATION=00AL07GE0001 ----------

COND_F	FIELD CONDUCTIVITY	5	261.0000	22.9608	328.0000	198.0000

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00AL07GJ0001 ----------

COND_F	FIELD CONDUCTIVITY	6	253.8333	43.3616	465.0000	185.0000

STATION=00AL11AA0001 ----------

COND_F	FIELD CONDUCTIVITY	7	257.4286	51.3447	470.0000	120.0000

STATION=00AL11AA0002 ----------

COND_F	FIELD CONDUCTIVITY	6	467.8333	44.9225	660.0000	330.0000

STATION=00AL11AA0003 ----------

COND_F	FIELD CONDUCTIVITY	69	673.5507	72.7209	4000.0000	175.0000

STATION=00AL11AA0014 ----------

COND_F	FIELD CONDUCTIVITY	0	.	.	.	.

TTATION=00MA05JM0001 ----------

COND_F	FIELD CONDUCTIVITY	14	1395.4286	60.2884	1750.0000	800.0000

STATION=00MA05KH0001 ----------

COND_F	FIELD CONDUCTIVITY	113	367.2832	4.8311	477.0000	240.0000

STATION=00MA05LD0001 ----------

COND_F	FIELD CONDUCTIVITY	64	537.3906	53.8482	2150.0000	170.0000

STATION=00MA05LE0002 ----------

COND_F	FIELD CONDUCTIVITY	15	525.0000	45.3286	790.0000	240.0000

STATION=00MA05LE0003 ----------

COND_F	FIELD CONDUCTIVITY	15	351.4667	24.3891	525.0000	240.0000

STATION=00MA05LH0001 ----------

COND_F	FIELD CONDUCTIVITY	12	1263.0000	135.7798	2000.0000	2.0000

STATION=00MA05LJ0001 ----------

COND_F	FIELD CONDUCTIVITY	12	510.0000	34.3831	740.0000	340.0000

STATION=00MA05LM0004 ----------

COND_F	FIELD CONDUCTIVITY	9	1776.2222	287.8782	4000.0000	1020.0000

TOTAL CYANIDE DATA BASE - SUMMARY STATISTICS FOR FIELD CONDUCTIVITY 11:43 WEDNESDAY, APRIL 2, 1986

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00MA05MH0001 ----------

COND_F	FIELD CONDUCTIVITY	12	950.0833	49.4228	1280.0000	570.0000

STATION=00MA05MH0003 ----------

COND_F	FIELD CONDUCTIVITY	1	1000.0000	.	1000.0000	1000.0000

STATION=00MA05MJ0017 ----------

COND_F	FIELD CONDUCTIVITY	12	882.2500	40.6694	1100.0000	630.0000

STATION=00MA05MJ0035 ----------

COND_F	FIELD CONDUCTIVITY	1	950.0000	.	950.0000	950.0000

STATION=00MA05NF0001 ----------

COND_F	FIELD CONDUCTIVITY	72	1173.0000	81.2448	4000.0000	370.0000

STATION=00MA05NF0005 ----------

COND_F	FIELD CONDUCTIVITY	6	663.6667	89.1428	850.0000	350.0000

STATION=00MA05NF0009 ----------

COND_F	FIELD CONDUCTIVITY	7	827.1429	159.9027	1600.0000	360.0000

STATION=00MA05NG0001 ----------

COND_F	FIELD CONDUCTIVITY	11	982.5455	145.5813	1980.0000	310.0000

STATION=00MA05NG0004 ----------

COND_F	FIELD CONDUCTIVITY	1	1220.0000	.	1220.0000	1220.0000

STATION=00MA05NG0013 ----------

COND_F	FIELD CONDUCTIVITY	39	931.8462	45.0296	1600.0000	350.0000

STATION=00MA05NG0014 ----------

COND_F	FIELD CONDUCTIVITY	1	1300.0000	.	1300.0000	1300.0000

STATION=00MA05NG0018 ----------

COND_F	FIELD CONDUCTIVITY	1	650.0000	.	650.0000	650.0000

STATION=00MA05OA0003 ----------

COND_F	FIELD CONDUCTIVITY	10	770.7000	93.1003	1400.0000	305.0000

TOTAL CYANIDE DATA BASE - SUMMARY STATISTICS FOR FIELD CONDUCTIVITY 11:43 WEDNESDAY, APRIL 2, 1986

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00MA05OB0001 ----------

COND_F	FIELD CONDUCTIVITY	68	799.9279	26.6540	1300.0000	8.1000

STATION=00MA05OB0011 ----------

COND_F	FIELD CONDUCTIVITY	4	762.5000	108.0413	900.0000	440.0000

STATION=00MA05OB0014 ----------

COND_F	FIELD CONDUCTIVITY	4	736.2500	136.6470	1000.0000	360.0000

STATION=00MA05DC0001 ----------

COND_F	FIELD CONDUCTIVITY	86	688.3140	25.9908	1580.0000	300.0000

STATION=00MA05DD0001 ----------

COND_F	FIELD CONDUCTIVITY	79	458.4304	18.6017	990.0000	190.0000

STATION=00MA05DD0007 ----------

COND_F	FIELD CONDUCTIVITY	10	361.9000	40.0201	530.0000	210.0000

STATION=00MA05DD0012 ----------

COND_F	FIELD CONDUCTIVITY	13	341.2308	16.4192	430.0000	190.0000

STATION=00MA05DJ0001 ----------

COND_F	FIELD CONDUCTIVITY	11	761.0000	39.0582	940.0000	500.0000

STATION=00MA05PF0022 ----------

COND_F	FIELD CONDUCTIVITY	74	122.2297	2.5781	173.0000	75.0000

STATION=00MA05RA0004 ----------

COND_F	FIELD CONDUCTIVITY	12	83.4167	6.5395	145.0000	64.0000

STATION=00MA05SH0001 ----------

COND_F	FIELD CONDUCTIVITY	12	389.2500	13.2334	450.0000	308.0000

STATION=00NW07PB0004 ----------

COND_F	FIELD CONDUCTIVITY	0	.	.	.	.

STATION=00NW07SB0003 ----------

COND_F	FIELD CONDUCTIVITY	1	1600.0000	.	1600.0000	1600.0000

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00NW07SB0005 ----------

COND_F	FIELD CONDUCTIVITY	0	.	.	.	.

STATION=00NW07SB0006 ----------

COND_F	FIELD CONDUCTIVITY	0	.	.	.	.

STATION=00NW07SB0008 ----------

COND_F	FIELD CONDUCTIVITY	0	.	.	.	.

STATION=00NW10EA0001 ----------

COND_F	FIELD CONDUCTIVITY	0	.	.	.	.

STATION=00NW10EA0002 ----------

COND_F	FIELD CONDUCTIVITY	0	.	.	.	.

STATION=00NW10EA0003 ----------

COND_F	FIELD CONDUCTIVITY	0	.	.	.	.

STATION=00NW10EA0005 ----------

COND_F	FIELD CONDUCTIVITY	0	.	.	.	.

STATION=00NW10JA0002 ----------

COND_F	FIELD CONDUCTIVITY	0	.	.	.	.

STATION=00NW10JA0005 ----------

COND_F	FIELD CONDUCTIVITY	0	.	.	.	.

STATION=00SA05EF0001 ----------

COND_F	FIELD CONDUCTIVITY	84	339.1786	5.1038	492.0000	222.0000

STATION=00SA05FE0001 ----------

COND_F	FIELD CONDUCTIVITY	107	913.6542	29.0587	2380.0000	380.0000

STATION=00SA05GC0001 ----------

COND_F	FIELD CONDUCTIVITY	12	2645.5833	214.3509	4345.0000	1810.0000

STATION=00SA05GG0001 ----------

COND_F	FIELD CONDUCTIVITY	10	354.7000	25.4620	497.0000	190.0000

TOTAL CYANIDE DATA BASE - SUMMARY STATISTICS FOR FIELD CONDUCTIVITY 11:43 WEDNESDAY, APRIL 2, 1986

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00SA05GG0003 ----------

COND_F	FIELD CONDUCTIVITY	11	397.8182	17.2030	480.0000	310.0000

STATION=00SA05HD0004 ----------

COND_F	FIELD CONDUCTIVITY	11	994.0000	114.5342	2080.0000	717.0000

STATION=00SA05HH0002 ----------

COND_F	FIELD CONDUCTIVITY	12	398.5833	11.4352	469.0000	350.0000

STATION=00SA05HH0004 ----------

COND_F	FIELD CONDUCTIVITY	1	430.0000	.	430.0000	430.0000

STATION=00SA05HH0007 ----------

COND_F	FIELD CONDUCTIVITY	8	448.6250	8.6704	500.0000	430.0000

STATION=00SA05JC0002 ----------

COND_F	FIELD CONDUCTIVITY	11	1452.7273	91.1077	2040.0000	1059.0000

STATION=00SA05JE0002 ----------

COND_F	FIELD CONDUCTIVITY	12	1468.0000	172.0376	2230.0000	682.0000

STATION=00SA05JF0002 ----------

COND_F	FIELD CONDUCTIVITY	8	1720.6250	118.7559	2250.0000	1225.0000

STATION=00SA05JK0002 ----------

COND_F	FIELD CONDUCTIVITY	19	1605.7368	106.5923	2478.0000	810.0000

STATION=00SA05JL0001 ----------

COND_F	FIELD CONDUCTIVITY	11	1472.7273	38.3240	1698.0000	1328.0000

STATION=00SA05JM0003 ----------

COND_F	FIELD CONDUCTIVITY	12	1450.9167	35.6006	1650.0000	1132.0000

STATION=00SA05JM0014 ----------

COND_F	FIELD CONDUCTIVITY	108	1458.0370	20.0436	1800.0000	415.0000

STATION=00SA05KH0002 ----------

COND_F	FIELD CONDUCTIVITY	120	1395.5583	85.9663	4625.0000	250.0000

TOTAL CYANIDE DATA BASE - SUMMARY STATISTICS FOR FIELD CONDUCTIVITY 11:43 WEDNESDAY, APRIL 2, 1986

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00SA05LC0001 ----------

COND_F	FIELD CONDUCTIVITY	122	557.0820	22.3701	1460.0000	183.0000

STATION=00SA05MD0002 ----------

COND_F	FIELD CONDUCTIVITY	122	959.4344	25.2865	1805.0000	240.0000

STATION=00SA05NA0002 ----------

COND_F	FIELD CONDUCTIVITY	9	1321.0000	148.4082	2052.0000	345.0000

STATION=00SA05NB0001 ----------

COND_F	FIELD CONDUCTIVITY	1	797.0000	.	797.0000	797.0000

STATION=00SA05NB0009 ----------

COND_F	FIELD CONDUCTIVITY	13	763.8462	47.2101	942.0000	462.0000

STATION=00SA05ND0001 ----------

COND_F	FIELD CONDUCTIVITY	78	1278.7692	56.8819	3100.0000	373.0000

STATION=00SA05ND0007

COND_F	FIELD CONDUCTIVITY	4	913.5000	70.7325	1025.0000	715.0000

STATION=00SA06AG0004

COND_F	FIELD CONDUCTIVITY	7	375.7143	42.8245	565.0000	250.0000

STATION=00SA06BB0004

COND_F	FIELD CONDUCTIVITY	18	245.8333	5.3799	310.0000	200.0000

STATION=00SA06CD0001

COND_F	FIELD CONDUCTIVITY	13	142.6154	5.5937	180.0000	120.0000

STATION=00SA06DA0001

COND_F	FIELD CONDUCTIVITY	11	21.7909	0.6939	27.0000	18.9000

STATION=00SA06EA0001

COND_F	FIELD CONDUCTIVITY	2	139.0000	1.0000	140.0000	138.0000

STATION=00SA06EA0003

COND_F	FIELD CONDUCTIVITY	84	94.0476	3.0526	152.0000	57.0000

VARIABLE	LABEL	N	MEAN	STD ERROR OF MEAN	MAXIMUM VALUE	MINIMUM VALUE

STATION=00SA07LC0001

COND_F	FIELD CONDUCTIVITY	9	36.0333	3.6598	64.0000	26.9000

STATION=00SA07MA0001

COND_F	FIELD CONDUCTIVITY	11	174.8182	9.6961	237.0000	136.0000

STATION=00SA11AB0005

COND_F	FIELD CONDUCTIVITY	7	828.4286	108.0789	1210.0000	540.0000

STATION=00SA11AB0006

COND_F	FIELD CONDUCTIVITY	3	532.6667	85.2962	685.0000	390.0000

STATION=00SA11AB0007

COND_F	FIELD CONDUCTIVITY	3	979.3333	77.9088	1080.0000	826.0000

STATION=00SA11AC0001

COND_F	FIELD CONDUCTIVITY	19	1100.6316	110.0821	1870.0000	320.0000

STATION=00SA11AC0002

COND_F	FIELD CONDUCTIVITY	28	939.2857	75.1545	2000.0000	210.0000